## CONTENTS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulations</td>
<td>i</td>
</tr>
<tr>
<td>PEOs</td>
<td>xxiii</td>
</tr>
<tr>
<td>POs</td>
<td>xxiv</td>
</tr>
<tr>
<td>Mapping of PEOs and POs</td>
<td>xxvi</td>
</tr>
<tr>
<td>Connectivity Chart</td>
<td>xxvii</td>
</tr>
<tr>
<td>Curriculum 2015</td>
<td>1</td>
</tr>
<tr>
<td>Syllabi (I – VIII Semesters)</td>
<td>9</td>
</tr>
<tr>
<td>Electives</td>
<td>132</td>
</tr>
</tbody>
</table>
REGULATIONS 2015

(CHOICE BASED CREDIT SYSTEM)

(Common to all B.E./B.Tech. Degree Programmes)

Regulation 2015 has been prepared in accordance with the guidelines given by the University Grants Commission, All India Council for Technical Education and affiliating University incorporating the features of the Choice Based Credit System (CBCS). The Regulation 2015 is applicable to the candidates admitted to the Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech.) Degree Programmes of the Institution in the academic year 2015-2016 for Regular admission (Academic year 2016-2017 for Lateral Entry) and subsequently.

*The regulations hereunder are subjected to amendments as may be decided by the Academic Council of the Institution from time to time. Any or all such amendments will be effective from such date and to such batches of students (including those already in the middle of the programme) as may be decided by the Academic Council.*

ADMISSION

Candidate, seeking admission to the B.E./B.Tech. Programme, shall satisfy the conditions of admission prescribed by the Directorate of Technical Education and Anna University, Chennai as given below.

1.1 **Regular Admission**

Candidates, for admission to the first semester of the eight semesters B.E./B.Tech. Degree Programmes, shall be required to have passed:

Higher Secondary Examination (10 +2) of Curriculum (Regular Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics, and Chemistry as three of the four subjects of the study prescribed under Part-III or any other examinations of any Board or University or authority accepted by the Syndicate of the University / Directorate of Technical Education (DoTE), Chennai as equivalent thereto.

(or)

Should have passed Higher Secondary Examination of Vocational Stream (Engineering/Technology), prescribed by the Government of Tamil Nadu.
1.2 Lateral Entry Admission

1.2.1 The candidates who possess Diploma in Engineering / Technology awarded by the State Board of Technical Education and Training, Tamil Nadu or its equivalent are eligible to apply for Lateral Entry admission to the third semester of B.E. / B.Tech. Programmes in the branch of study as per the eligibility criteria prescribed by the Directorate of Technical Education from time to time.

(or)

1.2.2 The candidates who possess the Bachelor Degree in Science (B.Sc.) (10+2+3 stream) with Mathematics as a subject in B.Sc. is eligible to apply for Lateral Entry admission to the third semester of B.E./B.Tech. Programmes, as per the eligibility criteria prescribed by the Directorate of Technical Education from time to time. Such candidates shall undergo two additional Engineering subject(s) one each in third and fourth semesters, as bridge courses.

PROGRAMMES OFFERED

A candidate may be offered admission to any one of the programmes offered by the Institution for the candidates specified in Clause 1.1 and as per the eligibility criteria of DoTE for the candidates under Clause 1.2 from the list given below:

**B. E. Programmes**
- Aeronautical Engineering
- Agricultural Engineering
- Automobile Engineering
- Civil Engineering
- Computer Science and Engineering
- Electrical and Electronics Engineering
- Electronics and Communication Engineering
- Electronics and Instrumentation Engineering
- Mechanical Engineering
- Mechatronics

**B. Tech. Programmes**
- Biotechnology
- Fashion Technology
- Information Technology
- Textile Technology
- Food Technology
STRUCTURE OF THE PROGRAMME

3.1 Every programme shall have a distinct curriculum with syllabi consisting of theory, laboratory, mini-project, life-skills and personality development courses, as prescribed by the respective Boards of Studies, broadly categorized under:

- **Basic Science** courses including Mathematics, Physics, Chemistry and further specialization in these subjects
- **Humanities and Social Science** courses including Language Courses, Management Courses, Life Skills and Professional Ethics.
- **Professional Courses** include Discipline Core Courses, Professional Electives, Core Electives and Open Electives.
- **Employability Enhancement Courses (EEC)** include Project Work and /or Internship, Seminar, Industrial /Practical Training, Value Added and Certificate Courses.

The assortment of different courses shall be designed that the student, at the end of the programme, would be able to be trained not only in his / her relevant professional field but also as a socially mindful human being.

The medium of instruction is English for all the Courses, Examinations, Seminar Presentation, Projects and any other courses that a student registers for.

3.2 Each course is normally assigned a certain number of credits, with 1 credit per lecture period per week, 1 credit for 2 periods of tutorial, 1 credit for 2 periods of laboratory courses, and 1 credit for 2 periods of seminar/project work per week.

3.3 A Diagnostic Test will be administered to all the B.E. / B.Tech. students after the admission to assess the proficiency in English and based on the score they will be brought under two streams namely, Stream A and Stream B. Students under Stream A will study **Communicative English I** and Stream B will study **Basic English I** under Language Elective I in the First Semester. In the Second Semester, Stream A will be further divided into two categories based on their English language proficiency assessed in the Continuous Assessment, while the upper segment can
enroll and study **German / Japanese / French / Chinese / Hindi** and the remaining students of that Stream will study **Communicative English II**. The students under Stream B will study **Basic English II** or may opt for **Communicative English II** based on the assessment carried out at the end of the semester I.

3.4 Every student shall be required to opt for **Nine** electives from the list of electives. Students can opt for the electives (Core / Professional / Open Elective) from any branch of B.E/B.Tech. Programmes, besides his / her own discipline courses, during V to VIII Semesters, if he/she satisfies the prerequisite for that particular course.

3.5 However, out of nine electives, every student shall be required to opt for, a minimum of three electives as open electives from the list of open electives of the branch / branches other than his / her branch of specialisation. There shall be no pre-requisite course(s) for such open electives.

3.6 Students can also opt for **one-credit courses** of 15 to 20 hour duration, which will be offered by the experts from the industry on specialised topics. Students can opt for such **one-credit courses** during the semesters I to VII as and when these courses are offered. A student will also be permitted to register the **one-credit courses** offered by other Departments, provided the student has fulfilled the necessary pre-requisites or the courses that may not require any pre-requisites. Under no circumstances, the same one credit course shall be repeated in subsequent semesters in any Department / Centre and a maximum batch size for a given course shall not exceed 40. In the case of disciplines with multiple divisions (intake more than 60) different course(s) shall be offered to other batch(es) of students.

On successful completion of one credit courses, Credits will be indicated in the Grade Sheet, but will not be considered for computing the Cumulative Grade Point Average (CGPA). However, if a student wishes to avail the exemption from any one of the Electives (other than open elective) of the Semester VIII, he / she can do so by exercising his / her option in writing to the respective Head of the Department during the beginning of the VIII Semester, following the equivalence norm, that **one regular elective** (in the **VIII Semester**) is equivalent to **three one-credit courses** completed by the student during the previous semesters, IV to VII. Details of the one credit courses offered by the department shall be forwarded to the Office.
of the Controller of Examinations. However one credit courses completed during I to III semesters shall be maintained in the Grade sheet as “Additional credits earned” (not considered for the computation of GPA/CGPA).

3.7 Fast Track System shall enable students to undergo a semester-long Internship or Special Training during Semester VIII. A student who secures a minimum CGPA of 8.50 in Semester IV with no current arrears, as on that date and maintains the CGPA of 8.50 till VI Semester without any arrears shall be eligible to opt for Fast Track System and such student is required to complete three elective courses satisfactorily, while completion of Semester VII, as additional Credits during the semesters V to VII.

3.8 Every student shall be required to carry out a Project Work in the Department / Industry or by exercising Fast track during VIII Semester in consultation with the Faculty Guide and submit the project report, in the prescribed format, at the end of the VIII Semester for the valuation.

3.9 A student can register for Self-Study Elective(s) over and above the electives from any branch of Engineering / Technology at the rate of one per semester starting from V semester onwards provided he/she maintains a Cumulative Grade Point Average (CGPA) of 8.50 or above till the previous semesters with no current arrears. Credits will be indicated for such courses in the grade sheets (additional credits) but will not be considered for computing the CGPA.

3.10 A Student may be permitted to credit online courses with the approval of the Departmental Consultative Committee constituted by the Head of the Department, subject to a maximum of three credits. Such students may be exempted from attending the classes, if such course(s) are offered in the semester. Summary of such on-line courses, taken by the students, along with the offering agency shall be presented to the Academic Council for information and further suggestions. However, those students need to obtain certification from the agency / agencies offering the course, to become eligible for writing or seeking exemption (core elective course) from the End Semester Examination. In case of credits earned through online mode, from the other Institute / University, the credits may also be transferred directly after due approval from the Departmental Consultative
Committee and the Office of the Controller of Examinations. A student can get exemption for a maximum of 3 credits during the entire programme (in lieu of Discipline elective or Open elective).

VALUE ADDED COURSES / ADD-ON COURSES
A Student can opt for the Value Added Courses / Add-on Courses offered by the various Department / Centres for which the batch size will not exceed 40 per course from Semester II to VII. Head of the Department / Centre shall submit the list of such courses, duly approved / ratified by the Academic Council, to the Controller of Examinations to administer the examination process. A separate Certificate will be issued on successful completion of the course by the Office of the Controller of Examinations.

DURATION OF THE PROGRAMME
5.1 A regular student (admitted after 10+2) or equivalent is normally expected to satisfactorily fulfil the requirements for award of the degree B.E. / B.Tech. within four academic years (8 semesters) from the date of admission but in any case not more than 7 years (14 Semesters); lateral entry students shall fulfil such requirements within three academic years (6 semesters) from the date of admission but in any case not more than six years (12 Semesters) leading to the award of Degree of Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech.) of Anna University, Chennai.

5.2 The total period for completion of the programme from the commencement of the semester, to which the student was admitted, shall not exceed the maximum period (Clause 5.1), regardless to the break-of-study (vide Clause 15) or period of prevention in order.

5.3 Each semester shall consist of minimum 90 working days or 450 periods of 60 minutes each or equivalent. Head of the Department shall ensure that every faculty member teaches the subject / course as prescribed in the approved curriculum and syllabi.

5.4 Special Theory / Practical Sessions may be conducted for students who require additional inputs over and above the number of periods normally specified
(Remedial Classes), as decided by the Head of the Department, within the specified duration of the Semester / Programme.

**COURSE ENROLLMENT AND REGISTRATION**

6.1 Each student, on admission shall be assigned to a Faculty Advisor (vide Clause 8) who shall advise / counsel the student about the details of the academic programme and the choice of course(s) considering the student’s academic background and career objectives.

6.2 Every student shall enroll for the courses of the succeeding semester, in the current semester. However, the student shall confirm the enrollment by registering for the courses within the first five working days after the commencement of the semester concerned.

6.3 After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the End Semester Examinations.

6.3.1 Each student, on admission to the programme, shall register for all the courses prescribed in the curriculum in the first Semester of study (III Semester for students admitted under lateral entry stream).

6.3.2 The enrollment for all the courses of the Semester II will commence 10 working days prior to the last working day of Semester I. The student shall confirm the enrollment by registering for the courses within the first five working days after the commencement of the Semester II. In the case, if a student fails to register in the course(s), he/ she may be permitted to register the same, as specified in the Clause 6.5, in the subsequent semesters or when it is offered.

6.3.3 The enrollment for the courses of the Semesters III to VIII will commence 10 working days prior to the last working day of the preceding semester. The student shall enroll for the courses with the guidance of the student’s Faculty Advisor. If a student wishes, the student may drop or add courses (vide Clause 6.4) within five working days after the commencement of the semester concerned and complete the registration process duly authorized by the Faculty Advisor.
6.4 Flexibility to Add or Drop courses

6.4.1 A student has to earn the total number of credits specified in the Curriculum of the respective Programme of study in order to be eligible to obtain the degree. However, if a student wishes, the student is permitted to earn more than the total number of credits prescribed in the curriculum by opting for one-credit courses, self-study electives or additional courses.

6.4.2 From the III to VIII semesters (from IV to VIII Semesters in case of lateral entry students), the student has the option of registering for additional courses or dropping existing courses. Total number of credits of such courses cannot exceed 6 in a given Semester. However, the maximum number of credits that a student can register in a particular semester shall not exceed 30 credits (regardless to the reappearance credits). In such cases, the attendance requirement as stated Clause 7 is mandatory.

6.4.3 The minimum number of credits that a student can register in a particular semester shall not be less than 18 credits (except VII / VIII semester).

6.4.4 The student shall register for the project work in the VIII semester only.

6.5 Reappearance Registration

6.5.1 If a student fails in a theory course, the student shall do reappearance registration (Examination) for that course in the subsequent semesters or when it is offered next.

6.5.2 On registration, a student may attend the classes for the reappearance registration courses, if the student wishes, and the attendance requirement (vide Clause 7) is not compulsory for such courses.

6.5.3 However, if a student wishes to improve his/her continuous assessment, in the second attempt during reappearance, shall satisfy the Clause 6.5.5 and appear for continuous assessment as given for that particular course.

6.5.4 If the theory course, in which the student has failed, is either a professional elective or an open elective, the student may register for the same or any other professional elective or open elective course, respectively in the subsequent semesters. However, the change of elective courses is permitted only once.
6.5.5 In this case (Clause 6.5.4), the student shall attend the classes, satisfy the attendance requirements (vide Clause 7), earn Continuous Assessment marks and appear for the End Semester Examination.

6.5.6 The student who fails in any Laboratory Course/ Project work / Seminar or any other EEC courses (Specified in Clause 3.1) shall register for the same in the subsequent semesters or when offered next, and repeat the course as per Clause 6.5.5.

6.5.7 If a student is prevented from writing the end semester examination of a course or several courses due to lack of attendance, the student has to register for that / those course(s) again, when offered next, attend the classes and fulfill the requirements as per Clause 6.5.5 & 6.5.6. If the course, in which the student has ‘lack of attendance’, is a Core Elective or an Open Elective, the student may register for the same or any other Core Elective or Open Elective course(s) respectively in the subsequent semesters and appear in the examination as per Clause 6.5.5.

7. REQUIREMENTS FOR APPEARING FOR THE END SEMESTER EXAMINATION OF A COURSE

A student who has fulfilled the following conditions (vide Clause 7.1 and 7.2) shall be deemed to have satisfied the attendance requirements for appearing for End Semester Examination of a particular course.

7.1 Every student is expected to attend all the periods and earn 100% attendance. However, a student shall secure not less than 80% attendance (Physical presence) course wise taking into account the number of periods required for that course as specified in the curriculum.

7.2 If a student, secures attendance between 70% and 79% in any course(s) in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) or participation in Institution/ University/ State/ National/ International level extra and co-curricular activities, with prior permission from the Head of the Department, shall be permitted to appear for the current semester examinations subject to the condition that the student shall submit the medical certificate / participation certificate attested by the Head of the Department (along
with Condonation form). Such certificates along with the condonation forms shall be forwarded to the Controller of Examinations for verification and permission to attend the examinations. However during the entire programme of study, a student can avail such Condonation in any two semesters only (regardless the number of courses).

7.3 A student shall normally be permitted to appear for End Semester Examination of the course(s) if the student has satisfied the attendance requirements (vide Clause 7.1 – 7.2) and has registered for examination in those courses of that semester by paying the prescribed fee.

7.4 Students who do not satisfy Clause 7.1 and 7.2 and who secure less than 70% attendance in a course will not be permitted to write the End-Semester Examination of that course. The student has to register and repeat this course in the subsequent semesters or when it is offered next (vide Clause 6.5).

7.5 In the case of reappearance registration for a course (vide Clause 6.5), the student has to register for examination in that course by paying the prescribed fee.

7.6 A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of grades.

FACULTY ADVISOR
To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a Faculty member of the Department who shall function as Faculty Advisor for those students. The Faculty Advisor shall advise and guide the students in registering of courses, reappearance of courses, monitor their attendance and progress and counsel them periodically. If necessary, the Faculty Advisor may also discuss with or inform the parents about the progress / performance of the students concerned.

COMMITTEES
9.1 Common Course Committee
9.1.1 A theory course handled by more than one faculty including the discipline with multiple divisions (greater than or equal to 2 ) shall have a “Common Course Committee” comprising of all members of faculty teaching that course with one
of the members as the Course Coordinator, nominated by the Head of the Institution (Head of the Department in the case of multiple divisions of a discipline) and student representatives (one per specialization or division) registered for that course in the current semester.

First meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. Two subsequent meetings in a semester may be held at suitable intervals. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all the students.

9.1.2 In addition, Common Course Committee (without the student representatives) shall meet to ensure uniform evaluation through the common question papers during Continuous Assessment and End Semester Examinations.

9.2 Class Committee Meeting

For all the courses taught, prescribed in the curriculum, Class Committee meeting shall be convened thrice in a semester (first meeting within 15 days from the commencement of the semester and other two meetings at equal interval after the first meeting) comprising members of the faculty handling all the courses and two student representatives from the class.

One of the members of the faculty (preferably not handling any courses to that class), nominated by the Head of the Department, shall coordinate the activities of the Committee. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to all other students.

10. SYSTEM OF EXAMINATION

10.1 Performance in each course of study shall be evaluated based on (i) Continuous Assessment throughout the semester and (ii) End Semester examination at the end of the semester for the regular courses or as given in the Clause 16. However, the
final examination in the case of one credit courses / certificate / value added courses may be conducted, as and when the course is completed, through the office of the Controller of Examinations.

10.2 Each course, both theory and practical including project work, shall be evaluated as per the Scheme of Assessment given in Clause 16.

10.3 The End Semester Examinations shall normally be conducted after satisfying the Clause 5.2. Supplementary Examinations may also be conducted, at such times, for the benefit of the students as decided by the Controller of Examinations.

10.4 For the End Semester examinations, both theory and practical courses including project work, the internal and external examiners (from Academia or Industry) shall be appointed by the Controller of Examinations as per the guidelines given by the Examination and Evaluation Board of the Institute.

11. PASSING REQUIREMENTS AND PROVISIONS

11.1 A student who secures not less than 50% of total marks prescribed for a course, vide Clause 16, comprising a minimum of 50% of the marks prescribed for the End Semester Examination, shall be declared to have passed the course successfully and earned the prescribed credits for that course, applicable for all registered courses.

11.1.1 If a student fails to secure a pass in a particular course, i.e., failing to obtain minimum marks, as stated above, it is mandatory that he/she shall register and reappear for the examination in that course in the subsequent semester(s) whenever the examinations are conducted for that course, till he / she secures a ‘Pass’.

11.1.2 Continuous Assessment (CA) marks obtained by the student in the first appearance shall be retained and considered valid for one subsequent attempt, except Clause 6.5.4, 6.5.5, 6.5.6 and 6.5.7. However, from the third attempt onwards, the student shall be declared to have passed the course if he/she secures a minimum of 6 Grade Points (B Grade) in the course prescribed during the End Semester Examinations.

11.2 The minimum number of total credits to be earned by a student to qualify for the award of Degree in the various branches of study as prescribed by the respective Boards of Studies is given below:
### Minimum Credits

<table>
<thead>
<tr>
<th>Branch of Study</th>
<th>Minimum Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regular Admission</td>
</tr>
<tr>
<td><strong>B.E. Programmes</strong></td>
<td></td>
</tr>
<tr>
<td>Aeronautical Engineering</td>
<td>178</td>
</tr>
<tr>
<td>Agricultural Engineering</td>
<td>177</td>
</tr>
<tr>
<td>Automobile Engineering</td>
<td>179</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>176</td>
</tr>
<tr>
<td>Computer Science and Engineering</td>
<td>176</td>
</tr>
<tr>
<td>Electrical and Electronics Engineering</td>
<td>176</td>
</tr>
<tr>
<td>Electronics and Communication Engineering</td>
<td>177</td>
</tr>
<tr>
<td>Electronics and Instrumentation Engineering</td>
<td>177</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>179</td>
</tr>
<tr>
<td>Mechatronics</td>
<td>177</td>
</tr>
<tr>
<td><strong>B.Tech. Programmes</strong></td>
<td></td>
</tr>
<tr>
<td>Biotechnology</td>
<td>175</td>
</tr>
<tr>
<td>Fashion Technology</td>
<td>176</td>
</tr>
<tr>
<td>Information Technology</td>
<td>176</td>
</tr>
<tr>
<td>Textile Technology</td>
<td>175</td>
</tr>
<tr>
<td>Food Technology</td>
<td>175</td>
</tr>
</tbody>
</table>

11.2.1 Student Migration and Credit Transfer: Normalization of the Credits will be carried out in consultation with the Board of Studies of the programme concerned and approved by the Head of Institution, if a student migrates from other institutions to Bannari Amman Institution of Technology or rejoins from previous regulation to this regulation.

11.3 A student shall be declared to have qualified for award of B.E/B.Tech. Degree if he/she successfully completes the course requirements (vide Clause 7, 10 and 11) and passed all the prescribed courses of study of the respective programme (listed in Clause 2), within the duration specified in Clause 5.1.
12. ASSESSMENT AND AWARD OF LETTER GRADES

12.1 The assessment shall be based on the performance in the End Semester Examinations and / or Continuous Assessment, carrying marks as specified in Clause 16. Letter Grades (based on Credit Point and Grade Point) are awarded to the students based on the performance in the evaluation process.

12.2 Credit Point is the product of Grade Point and number credits for a course and Grade Point is a numerical weight allotted to each letter grade on a 10-point scale (as specified in the Clause 12.3), while the Letter Grade is an index of the performance of a student in a said course.

12.3 The performance of a student will be reported using Letter Grades, each carrying certain points as detailed below:

<table>
<thead>
<tr>
<th>Range of Total Marks (as specified in Clause 16) / Specific Reason</th>
<th>Grade Points</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>91 to 100</td>
<td>10</td>
<td>O (Outstanding)</td>
</tr>
<tr>
<td>81 to 90</td>
<td>9</td>
<td>A + (Excellent)</td>
</tr>
<tr>
<td>71 to 80</td>
<td>8</td>
<td>A (Very Good)</td>
</tr>
<tr>
<td>61 to 70</td>
<td>7</td>
<td>B + (Good)</td>
</tr>
<tr>
<td>50 to 60</td>
<td>6</td>
<td>B (Above average)</td>
</tr>
<tr>
<td>0 to 49</td>
<td>0</td>
<td>RA (Reappearance Registration)</td>
</tr>
<tr>
<td>Incomplete</td>
<td>0</td>
<td>I</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>0</td>
<td>W</td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td>AB</td>
</tr>
<tr>
<td>Shortage of Attendance</td>
<td>0</td>
<td>SA</td>
</tr>
</tbody>
</table>

‘RA’ --- Reappearance registration is required for that particular course

‘I’ --- Continuous evaluation is required for that particular course in the subsequent examinations.

‘SA’ --- shortage of attendance (Clause 7) and hence prevented from writing end semester examination.

12.4 After completion of the evaluation process, Grade Point Average (GPA), and the Cumulative Grade Point Average (CGPA) is calculated using the formula:
\[ \text{GPA/CGPA} = \frac{\sum_{i=1}^{n} C_i \cdot g_i}{\sum_{i=1}^{n} C_i} \]

where

- \( C_i \): Credit allotted to the course.
- \( g_i \): Grade Point secured corresponding to the course.
- \( n \): number of courses successfully cleared during the particular semester in the case of GPA and all the semesters, under consideration, in the case CGPA.

12.5 A student who does not appear for the End Semester Examinations in a course, after registering for the same, shall be deemed to have appeared for that examination for the purpose of classification (Subject to Clause 14 and 15).

12.6 For the non credit courses Grades shall be indicated as given in the Clause 16 and shall not be counted for the computation of GPA/CGPA.

12.7 **Photocopy / Revaluation:** A student, who seeks the re-valuation of the answer script is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s), within 2 working days from the declaration of results in the prescribed format to the Controller of Examinations through the Head of the Department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation through proper application to the Controller of Examinations. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses. In the case of theory courses with laboratory component, a student can seek revaluation for the theory component only, following the procedure stated above.

**CLASSIFICATION OF THE DEGREE AWARDED**

For the purpose of the ‘Award of Degree’, the duration of completion of the programme shall be the total duration taken by a student for completing first time registration of all the required courses and satisfying Clause 11, regardless to the period of Break-of-study as per Clause 15 and satisfy any one of the conditions required as given below.
13.1 **First Class with Distinction**: A student who qualifies for the award of the Degree having passed all the courses of study of all the Eight Semesters (six semesters for lateral entry students) at the first opportunity, after the commencement of his / her study and securing a CGPA not less than 8.50 (vide clause 12.3) shall be declared to have passed with **First Class with Distinction**.

13.2 **First Class**: A student who qualifies for the award of the Degree having passed all the courses of study of all the eight semesters (six semesters for lateral entry students) after the commencement of his / her study and securing a CGPA not less than 6.50 shall be declared to have passed with **First Class** (not exceeded the total duration as specified in the Clause 5).

13.3 **Second Class**: All other students who qualify for the award of the Degree shall be declared to have passed in **Second Class**.

13.4 Course Completion Certificate shall be given to a student, provided he / she should have registered all the courses and also registered for the examinations in those courses (subject to Clause 6.0 and 7.0).

14. **WITHDRAWAL FROM THE EXAMINATION**

14.1 A student may, for valid reasons, be granted permission by the Head of the Department to withdraw from appearing in the examination in any course(s) only once during the entire duration of the degree programme.

14.2 Withdrawal application shall be valid only, if the student is eligible to write the examination as per Clause 7 and, if such request for withdrawal is made prior to the submission of the Continuous Assessment marks of the course(s) with the recommendations from the Head of the Department.

14.3 Withdrawal shall not be considered as an appearance in the examination for the eligibility of a student for First Class with Distinction or First Class.

15. **AUTHORIZED BREAK OF STUDY FROM A PROGRAMME**

15.1 A student is permitted to go on break of study for a maximum period of one year either as two breaks of one semester each or a single break of one year.

15.2 A student is normally not permitted to break the period of study temporarily. However, if a student happens to discontinue the programme temporarily during the
middle of programme of study, for reasons such as personal accident or hospitalization due to ill health or in need of health care, he/she shall apply to the Head of the Institution in advance, in any case, not later than the last date for registering for the semester examination, through the Head of the Department stating the reasons for the break-of-study (for one academic semester or 6 months, whichever is earlier). However, a student detained for want of minimum attendance requirement as per Clause 7 shall not be considered as permitted ‘Break of Study’ and Clause 15.3 is not applicable for such case.

15.3 The student is permitted to rejoin the programme after the break shall be governed by the rules and regulations of DoTE and the Curriculum and Regulations in force at the time of rejoining, subject to the Clause 11.2.1.

15.4 Authorized break of study will be counted towards the duration specified for passing all the courses (vide Clause 5.1 and 5.2) and for the purpose of classification of Degree (vide Clause 13).

15.5 The total period for completion of the programme reckoned from the commencement of the first semester to which the student is admitted shall not exceed the maximum period specified in Clause 5.1, irrespective of the period of break of study in order that he / she may be eligible, for the award of the degree (vide Clause 13).

15.6 In case of valid reasons (as stated in Clause 15.2) extended break-of-study may be granted by the Head of the Institution for a period not more than one year (total duration or two semesters whichever is earlier) in addition to the earlier authorized break of study.

15.7 If a student does not report back to the Institute, even after the extended Break of Study, the name of the student shall be deleted permanently from the college enrollment. Such students are not entitled to seek readmission under any circumstances.
SCHEME OF ASSESSMENT

Courses offered under B.E. / B.Tech. Programmes are assessed as given below:

<table>
<thead>
<tr>
<th>I</th>
<th>THEORY COURSES</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuous Assessment</td>
<td>50</td>
</tr>
<tr>
<td>Distribution of marks for Continuous Assessment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test I (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test II (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open book test (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library - Seminars / Assignments (Two) (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End Semester Examination</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Total Marks</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II</th>
<th>THEORY COURSES WITH LAB COMPONENT</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuous Assessment</td>
<td>50</td>
</tr>
<tr>
<td>Distribution of marks for Continuous Assessment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test I (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test II (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conduct of Experiment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment and Results (5)</td>
<td>#</td>
<td></td>
</tr>
<tr>
<td>Record Note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Lab Examination (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End Semester Examination (QP pattern as per I)</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Total Marks</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LABORATORY COURSES</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Assessment</td>
<td>50</td>
</tr>
<tr>
<td>Distribution of marks for Continuous Assessment:</td>
<td></td>
</tr>
<tr>
<td>Conduct of Experiment</td>
<td></td>
</tr>
<tr>
<td>Preparation (5)</td>
<td></td>
</tr>
<tr>
<td>Experiment and Results (10)</td>
<td>#</td>
</tr>
<tr>
<td>Record / Observation</td>
<td></td>
</tr>
<tr>
<td>Test – Cycle I (15)</td>
<td></td>
</tr>
<tr>
<td>Test – Cycle II (15)</td>
<td></td>
</tr>
<tr>
<td>End Semester Examination</td>
<td></td>
</tr>
<tr>
<td>Experiments &amp; Results (40)</td>
<td>50</td>
</tr>
<tr>
<td>Viva Voce – (10)</td>
<td></td>
</tr>
<tr>
<td>Total Marks</td>
<td>100</td>
</tr>
</tbody>
</table>

Reports / Record Note / Integrated Lab Manual to be retained for 1 year for Academic Audit, by respective Department
### IV TECHNICAL SEMINAR

**Continuous Assessment**

<table>
<thead>
<tr>
<th>Distribution of marks for Continuous Assessment:</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation I (25)</td>
<td></td>
</tr>
<tr>
<td>Presentation II (25)</td>
<td></td>
</tr>
</tbody>
</table>

**End Semester Examination**

| Report (20)                                      | 50    |
| Presentation (20)                               |       |
| Viva voce (10)                                  |       |

**Total Marks**

| 100 |

### V PROJECT

**Continuous Assessment**

<table>
<thead>
<tr>
<th>Distribution of marks for Continuous Assessment: Review I</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature survey (10)</td>
<td></td>
</tr>
<tr>
<td>Problem Identification (5)</td>
<td></td>
</tr>
<tr>
<td>Methodology (10)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review II</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuation in Methodology (10)</td>
<td></td>
</tr>
<tr>
<td>Results / Progress (15)</td>
<td></td>
</tr>
</tbody>
</table>

**End Semester Examination**

| Report (20)                                            | 50    |
| Presentation (20)                                      |       |
| Viva voce (10)                                         |       |

**Total Marks**

| 100 |

### VI LANGUAGE ELECTIVE

(Contiguous Assessment Only)

<table>
<thead>
<tr>
<th>Test 1</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening (10)</td>
<td>25</td>
</tr>
<tr>
<td>Speaking (5)</td>
<td></td>
</tr>
<tr>
<td>Reading (5)</td>
<td></td>
</tr>
<tr>
<td>Writing (5)</td>
<td></td>
</tr>
<tr>
<td>Test 2</td>
<td></td>
</tr>
<tr>
<td>Listening (10)</td>
<td>25</td>
</tr>
<tr>
<td>Speaking (5)</td>
<td></td>
</tr>
<tr>
<td>Reading (5)</td>
<td></td>
</tr>
<tr>
<td>Writing (5)</td>
<td></td>
</tr>
<tr>
<td>Oral Exam</td>
<td>50</td>
</tr>
</tbody>
</table>

**Total Marks**

| 100 |

---

Reports / Record Note / Integrated Lab Manual to be retained for 1 year for Academic Audit, by respective Department.
### VII ONE-CREDIT COURSE

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>30</td>
</tr>
<tr>
<td>Quiz</td>
<td>20</td>
</tr>
<tr>
<td>Final Examination</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### VIII MINI-PROJECT

(CONTINUOUS ASSESSMENT ONLY)

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review I</td>
<td>25</td>
</tr>
<tr>
<td>Review II</td>
<td>25</td>
</tr>
<tr>
<td>Project Evaluation</td>
<td></td>
</tr>
<tr>
<td>Report (25)</td>
<td>50</td>
</tr>
<tr>
<td>Presentation &amp; Viva Voce (25)</td>
<td></td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### IX LIFE SKILLS

(CONTINUOUS ASSESSMENT ONLY)

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test I</td>
<td>25</td>
</tr>
<tr>
<td>Test II</td>
<td>25</td>
</tr>
<tr>
<td>Final Examination</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>Grades (Excellent / Good / Satisfactory / Not Satisfactory)</td>
<td></td>
</tr>
</tbody>
</table>

### X VALUE ADDED / CERTIFICATE COURSES

(CONTINUOUS ASSESSMENT ONLY)

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test I</td>
<td>25</td>
</tr>
<tr>
<td>Test II</td>
<td>25</td>
</tr>
<tr>
<td>Final Evaluation / Test</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>Grades (Excellent / Good / Satisfactory / Not Satisfactory)</td>
<td></td>
</tr>
</tbody>
</table>

### XI ENGINEERING GRAPHICS

Continuous Assessment 50

Distribution of marks for Continuous Assessment:

- Class work (based on attendance) (5)
- Assignments (Minimum 8 Assignments) (20)
- Model Examination (25)
- **End Semester Examination** 50
- **Total Marks** 100

Reports / Record Note / Integrated Lab Manual to be retained for 1 year for Academic Audit, by respective Department
Optional Test: A student becomes eligible to appear for the one optional test conducted after the Periodical Test II, only under the following circumstances: (i) absent for Test I or Test II or both on account of medical reasons (hospitalization / accident / specific illness), or (ii) participation in the College / University / State / National / International level Sports events with prior permission from the Head of the Institution and (iii) on satisfying the conditions (i) or (ii), the student should have registered for the Optional Test, through the concerned member of faculty who handles the course or through the respective Head of the Department, submitted to the Controller of Examinations. Such Optional Tests are not conducted for the courses under the categories III, IV, V, VI, VII, VIII, IX, X and XI listed above.

17. FIELD / INDUSTRIAL VISIT / INTERNSHIP

Heads of Departments, in order to provide the experiential learning to the students, shall take efforts to arrange at least two industrial visits / field visits in a semester. The students may also undergo in-plant training / internship during summer / winter vacation between III and VII semesters.

18. PERSONALITY AND CHARACTER DEVELOPMENT

Every student shall be required to undergo a minimum of 40 hours of Personality Development Programmes viz, NSS / NCC / YRC / YOGA / Sports and Games / Technical and Non-technical Club activities during the first year, failing which he/she shall not be permitted to appear for the End Semester examinations of semester II and there onwards. Such students are permitted to appear for the End Semester examinations of semester II and there onwards only after completing satisfactorily the requirements.

The attendance of the personality and character development courses / events shall be maintained on the regular basis by the concerned First Year Co-ordinators and made available in the Office of the Controller of Examinations before the commencement of Semester examinations of Semester I or Semester II.
19. DISCIPLINE

A student is expected to follow the rules and regulations laid down by the Institute and the affiliating University, as published from time to time. Any violations, if any, shall be treated as per the procedures stated thereof.

If a student indulges in malpractice in any of the End Semester / Continuous Assessments, he / she shall be liable for punitive action as prescribed by the Institution / University from time to time.

20. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The Institution reserves the right to revise/amend/change the Regulations, Curriculum, Syllabi, Scheme of Examinations and date of implementation and to introduce Additional Electives, Open Electives, One Credit Courses and Value Added Courses through the Academic Council.

The Question Paper pattern (Theory Examination) for UG Programme is given below:

<table>
<thead>
<tr>
<th>PART A</th>
<th>Objective Type Questions: 20</th>
<th>(20X1 = 20 Marks)</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>PART B</td>
<td>Short Answer Questions: 10</td>
<td>(10X2 = 20 Marks)</td>
<td>20</td>
</tr>
<tr>
<td>PART C</td>
<td>Long Answer Questions: 5</td>
<td>(5X12 = 60 Marks)</td>
<td>60</td>
</tr>
</tbody>
</table>

Total 100
PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

**PEO1**  Apply Computational Theory blended with Mathematics and Engineering to model, design, implement, test and maintain software systems

**PEO2**  Communicate effectively with team members, engage in applying technologies and lead teams in industry

**PEO3**  Excel in Professional development, Higher studies and Entrepreneurship related to IT

**PEO4**  Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs
PROGRAM OUTCOMES

Engineering Graduates will be able to:

a. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. **Problem Analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. **Design/ Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

f. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
## MAPPING of PEOs and POs

<table>
<thead>
<tr>
<th>PEs</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEO1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEO2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEO3</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEO4</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
# B.Tech. INFORMATION TECHNOLOGY

Minimum Credits to be Earned: 176

## FIRST SEMESTER

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Objectives &amp; Outcomes</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>Maximum Marks</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>15MA101</td>
<td>MATRICES AND CALCULUS*</td>
<td>II a,b</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>50</td>
<td>BS</td>
</tr>
<tr>
<td>15PH102</td>
<td>ENGINEERING PHYSICS*</td>
<td>II a</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>50</td>
<td>BS</td>
</tr>
<tr>
<td>15CH103</td>
<td>ENVIRONMENTAL SCIENCE*</td>
<td>II g</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>50</td>
<td>HSS</td>
</tr>
<tr>
<td></td>
<td>LANGUAGE ELECTIVE I#</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td>HSS</td>
</tr>
<tr>
<td>15GE205</td>
<td>BASICS OF CIVIL AND MECHANICAL ENGINEERING</td>
<td>I, IV a</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50</td>
<td>ES</td>
</tr>
<tr>
<td>15GE106</td>
<td>C PROGRAMMING±</td>
<td>I, IV a, 1</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>50</td>
<td>ES</td>
</tr>
<tr>
<td>15GE207</td>
<td>ENGINEERING GRAPHICS²</td>
<td>I, IV a,e</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>50</td>
<td>ES</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td>13</td>
<td>2</td>
<td>10</td>
<td>22</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

## SECOND SEMESTER

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Objectives &amp; Outcomes</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>Maximum Marks</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>15MA201</td>
<td>VECTOR CALCULUS AND COMPLEX ANALYSIS*</td>
<td>II a,b</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>50</td>
<td>BS</td>
</tr>
<tr>
<td></td>
<td>PHYSICS ELECTIVE*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50</td>
<td>BS</td>
</tr>
<tr>
<td></td>
<td>CHEMISTRY ELECTIVE*</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50</td>
<td>BS</td>
</tr>
<tr>
<td></td>
<td>LANGUAGE ELECTIVE II#</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td>HSS</td>
</tr>
<tr>
<td>15GE105</td>
<td>BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING^</td>
<td>I, IV a</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>50</td>
<td>ES</td>
</tr>
<tr>
<td>15IT206</td>
<td>PROGRAMMING USING C++</td>
<td>I, IV c, d, e</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>50</td>
<td>ES</td>
</tr>
<tr>
<td>15GE107</td>
<td>WORKSHOP PRACTICEΩ</td>
<td>I, IV a,e</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50</td>
<td>ES</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>23</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

Common to all branches of B.E/B.Tech
Common to all branches of B.E/B.Tech (Continuous Assessment)

- Common to CSE, ECE, EEE, EIE, FT, IT (I Semester) and to MTRS, BT, TT, FD (II Semester)
- Common to CSE, ECE, EEE, EIE, IT
- Common to CE, CSE, ECE, EEE, EIE, IT (I Semester) and to AE, AG, AU, ME, MTRS, BT, TT, FD (II Semester)
- Common to AE, AG, AU, CE, ME, MTRS, BT, TT, FD (I Semester) and to CSE, FT, IT (II Semester)
- Common to CSE and IT
- Common to AE, AG, AU, ME, MTRS, BT, TT, FD (I Semester) and to CE, CSE, ECE, EEE, EIE, IT (II Semester)
### THIRD SEMESTER

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Objectives &amp; Outcomes</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>Maximum Marks</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>15MA301</td>
<td>FOURIER SERIES AND TRANSFORMS $\alpha$</td>
<td>I-IV a,b</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>50 50 100</td>
<td>BS</td>
</tr>
<tr>
<td>15IT302</td>
<td>DIGITAL SYSTEM DESIGN</td>
<td>I-IV b,c,e,g</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>50 50 100</td>
<td>ES</td>
</tr>
<tr>
<td>15IT303</td>
<td>COMPUTER ARCHITECTURE</td>
<td>I-IV a,b,c,d,e,l</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT304</td>
<td>SOFTWARE ENGINEERING</td>
<td>I-IV a,b,c,d,e,f, g,i</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT305</td>
<td>DATA STRUCTURES AND ALGORITHMS</td>
<td>I,III,II a,b,c</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT306</td>
<td>JAVA PROGRAMMING</td>
<td>I,III,II a,b,c</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT307</td>
<td>DIGITAL SYSTEM DESIGN LABORATORY</td>
<td>I-IV b,c,e,g</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT308</td>
<td>DATA STRUCTURES AND ALGORITHMS LABORATORY</td>
<td>I,III,II a,b</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT309</td>
<td>MINI PROJECT I</td>
<td>I,III,II a-l</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>100 - 100</td>
<td>EEC</td>
</tr>
<tr>
<td>15GE310</td>
<td>LIFE SKILLS: BUSINESS ENGLISH $\Phi$</td>
<td>I, IV j</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>100 - 100</td>
<td>EEC</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>18</td>
<td>4</td>
<td>10</td>
<td>24</td>
<td>600 400 1000</td>
<td>-</td>
</tr>
</tbody>
</table>

### FOURTH SEMESTER

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Objectives &amp; Outcomes</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>Maximum Marks</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>15MA404</td>
<td>DISCRETE MATHEMATICS</td>
<td>I,IV a,b</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>BS</td>
</tr>
<tr>
<td>15IT402</td>
<td>DATABASE MANAGEMENT SYSTEMS</td>
<td>I-IV a,b,c,e,g,k</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT403</td>
<td>OBJECT ORIENTED ANALYSIS AND DESIGN</td>
<td>I-IV a,b,c,e,k</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT404</td>
<td>COMMUNICATION ENGINEERING</td>
<td>I-IV a,b,c,d,f,g</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT405</td>
<td>COMPUTER NETWORKS</td>
<td>I-IV a,d,e,g,i,j</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT406</td>
<td>MICROPROCESSORS AND MICROCONTROLLERS</td>
<td>I-IV a,b,c,d,e,f</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT407</td>
<td>DATABASE MANAGEMENT SYSTEMS LABORATORY</td>
<td>I-IV a,b,c,e,g,k</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT408</td>
<td>COMPUTER NETWORKS LABORATORY</td>
<td>I,III,II a,d,e</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT409</td>
<td>MINI PROJECT II</td>
<td>I,III,II a-l</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>100 - 100</td>
<td>EEC</td>
</tr>
<tr>
<td>15GE410</td>
<td>LIFE SKILLS: VERBAL ABILITY $\Phi$</td>
<td>I, IV j</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>100 - 100</td>
<td>EEC</td>
</tr>
</tbody>
</table>

| Total     |                        | 16| 2 | 12| 22| 600 400 1000 | -        |

Common to all branches of B.E./B.Tech. except CSE
Common to all branches of B.E./B.Tech (Non-Credit Course)
### FIFTH SEMESTER

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Objectives &amp; Outcomes</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>Maximum Marks</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>15IT501</td>
<td>WEB TECHNOLOGY</td>
<td>I-IV a,c,d,e,k</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT502</td>
<td>SYSTEM PROGRAMMING AND OPERATING SYSTEMS</td>
<td>I-IV a,b,c,e,k</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT503</td>
<td>COMPUTATIONAL THEORY AND COMPILERS</td>
<td>I-IV a,b,c,d,e,f</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT504</td>
<td>DIGITAL SIGNAL PROCESSING</td>
<td>I-IV a,b,c,d,e,f</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>ES</td>
</tr>
<tr>
<td></td>
<td>ELECTIVE I</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3 50 50 100</td>
<td>PE</td>
</tr>
<tr>
<td></td>
<td>ELECTIVE II</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3 50 50 100</td>
<td>PE</td>
</tr>
<tr>
<td>15IT507</td>
<td>WEB TECHNOLOGY LABORATORY</td>
<td>I-IV c,d,e,k,l</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT508</td>
<td>DIGITAL SIGNAL PROCESSING LABORATORY</td>
<td>I,III II a,b,c,e</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>ES</td>
</tr>
<tr>
<td>15IT509</td>
<td>TECHNICAL SEMINAR I</td>
<td>I-IV d,f,i,j,k</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>EEC</td>
</tr>
<tr>
<td>15IT510</td>
<td>MINI PROJECT III</td>
<td>I-IV a-l</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>100</td>
<td>EEC</td>
</tr>
<tr>
<td>15GE511</td>
<td>LIFE SKILLS: APTITUDE I</td>
<td>I,IV a,b</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>100</td>
<td>EEC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>12</td>
<td>2</td>
<td>12</td>
<td>24</td>
<td>650 450 1100</td>
<td></td>
</tr>
</tbody>
</table>

### SIXTH SEMESTER

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Objectives &amp; Outcomes</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>Maximum Marks</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>15GE701</td>
<td>ENGINEERING ECONOMICS§</td>
<td>II a,f,g,k,l</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>HSS</td>
</tr>
<tr>
<td>15IT602</td>
<td>DATA MINING AND ANALYTICS</td>
<td>I-IV a,c,d,f,k</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT603</td>
<td>INFORMATION TECHNIQUES CODING</td>
<td>I-IV a,b,c,g,k</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>50 50 100</td>
<td>ES</td>
</tr>
<tr>
<td>15IT604</td>
<td>DESIGN AND ANALYSIS OF ALGORITHMS</td>
<td>I-IV a,c,d,f</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td></td>
<td>ELECTIVE III</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3 50 50 100</td>
<td>PE</td>
</tr>
<tr>
<td></td>
<td>ELECTIVE IV</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3 50 50 100</td>
<td>PE</td>
</tr>
<tr>
<td>15IT607</td>
<td>DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY</td>
<td>I-IV a,d,e,f</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT608</td>
<td>DATA MINING AND ANALYTICS LABORATORY</td>
<td>I-IV a,c,e,f</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT609</td>
<td>TECHNICAL SEMINAR II</td>
<td>I-IV a,d,f,j</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>EEC</td>
</tr>
<tr>
<td>15IT610</td>
<td>MINI PROJECT IV</td>
<td>I-IV a-l</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>100</td>
<td>EEC</td>
</tr>
<tr>
<td>15GE611</td>
<td>LIFE SKILLS: APTITUDE II§</td>
<td>I,IV a,b</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>100</td>
<td>EEC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>12</td>
<td>2</td>
<td>10</td>
<td>23</td>
<td>650 450 1100</td>
<td></td>
</tr>
</tbody>
</table>

§ Common to all branches of B.E./B.Tech (Non-Credit Course)

§§ Common to CSE, ECE, EEE, EIE, IT (VI Semester) and to AE, AG, AU, CE, ME, MTRS, BT, FT, TT, FD (VII Semester)
<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Objectives &amp; Outcomes</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>Maximum Marks</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>15GE601</td>
<td>PROFESSIONAL ETHICS +</td>
<td>II</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>50 50 100</td>
<td>HSS</td>
</tr>
<tr>
<td>15IT702</td>
<td>GRAPHICS AND MULTIMEDIA</td>
<td>I-IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT703</td>
<td>XML AND WEB SERVICES</td>
<td>I-IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT704</td>
<td>INFORMATION SECURITY</td>
<td>I-IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td></td>
<td>ELECTIVE V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50 50 100</td>
<td>PE</td>
</tr>
<tr>
<td></td>
<td>ELECTIVE VI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50 50 100</td>
<td>PE</td>
</tr>
<tr>
<td>15IT707</td>
<td>GRAPHICS AND MULTIMEDIA LABORATORY</td>
<td>I-IV</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT708</td>
<td>XML AND WEB SERVICES LABORATORY</td>
<td>I,III,II</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>50 50 100</td>
<td>PC</td>
</tr>
<tr>
<td>15IT709</td>
<td>MINI PROJECT V</td>
<td>I-IV</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>100</td>
<td>EEC</td>
</tr>
<tr>
<td>15GE710</td>
<td>LIFE SKILLS : COMPETITIVE EXAMS</td>
<td>I,II,III</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>100</td>
<td>EEC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td>EEC</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td>11</td>
<td>0</td>
<td>8</td>
<td>20</td>
<td>600 400 1000</td>
<td>-</td>
</tr>
</tbody>
</table>

**EIGHT SEMESTER**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Objectives &amp; Outcomes</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>Maximum Marks</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ELECTIVE VII</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 50 50 100</td>
<td>PE</td>
</tr>
<tr>
<td></td>
<td>ELECTIVE VIII</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 50 50 100</td>
<td>PE</td>
</tr>
<tr>
<td></td>
<td>ELECTIVE IX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 50 50 100</td>
<td>PE</td>
</tr>
<tr>
<td>15IT804</td>
<td>PROJECT WORK</td>
<td>I-IV</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>50 50 100</td>
<td>EEC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50 50 100</td>
<td>EEC</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18 200 200 400</td>
<td>-</td>
</tr>
</tbody>
</table>

Common to AE, AU, CE, ME, MTRS, BT, FT, TT, FD (VI Semester) and to CSE, ECE, EEE, EIE, IT (VII Semester)
Common to all branches of B.E./B.Tech (Non-Credit Course)
<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course</th>
<th>Objectives &amp; Outcomes</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LANGUAGE ELECTIVES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15LE101</td>
<td>BASIC ENGLISH I</td>
<td>II</td>
<td>j</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15LE102</td>
<td>COMMUNICATIVE ENGLISH I</td>
<td>II</td>
<td>j</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15LE201</td>
<td>BASIC ENGLISH II</td>
<td>II</td>
<td>j</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15LE202</td>
<td>COMMUNICATIVE ENGLISH II</td>
<td>II</td>
<td>j</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15LC203</td>
<td>CHINESE</td>
<td>II</td>
<td>j</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15LF203</td>
<td>FRENCH</td>
<td>II</td>
<td>j</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15LG203</td>
<td>GERMAN</td>
<td>II</td>
<td>j</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15LH203</td>
<td>HINDI</td>
<td>II</td>
<td>j</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15LJ203</td>
<td>JAPANESE</td>
<td>II</td>
<td>j</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>PHYSICS ELECTIVES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15PH201</td>
<td>PHYSICS OF MATERIALS</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15PH202</td>
<td>APPLIED PHYSICS</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15PH203</td>
<td>MATERIALS SCIENCE</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15PH204</td>
<td>PHYSICS OF ENGINEERING MATERIALS</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15PH205</td>
<td>SOLID STATE PHYSICS</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>CHEMISTRY ELECTIVES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15CH201</td>
<td>ENGINEERING CHEMISTRY</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15CH202</td>
<td>APPLIED CHEMISTRY</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15CH203</td>
<td>APPLIED ELECTROCHEMISTRY</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15CH204</td>
<td>INDUSTRIAL CHEMISTRY</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15CH205</td>
<td>WATER TECHNOLOGY AND GREEN CHEMISTRY</td>
<td>I</td>
<td>a</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>DISCIPLINE ELECTIVES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT001</td>
<td>SOFTWARE TESTING METHODS AND TOOLS</td>
<td>I-IV</td>
<td>a,c,e,j,k</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15IT002</td>
<td>C# and .NET</td>
<td>I-IV</td>
<td>a,c,d,e,i,k</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15IT003</td>
<td>SOFTWARE QUALITY MANAGEMENT</td>
<td>I-IV</td>
<td>b,c,k</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15IT004</td>
<td>REAL TIME SYSTEMS</td>
<td>I,II,III</td>
<td>b,c</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15IT005</td>
<td>PARALLEL PROCESSING</td>
<td>I-IV</td>
<td>a,b,c,i</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15IT006</td>
<td>BIG DATA ANALYTICS</td>
<td>I-IV</td>
<td>a,b,d,e,g,l</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15IT007</td>
<td>DISASTER MANAGEMENT</td>
<td>I-IV</td>
<td>b,f,k</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15IT008</td>
<td>MANAGEMENT INFORMATION SYSTEMS</td>
<td>I-IV</td>
<td>a,b,c,d,e,g,i</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15IT009</td>
<td>NATURAL LANGUAGE PROCESSING</td>
<td>I-IV</td>
<td>a,b,c,f</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Semesters</td>
<td>Module Code</td>
<td>Credits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>-----------</td>
<td>-------------</td>
<td>---------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT010</td>
<td>DIGITAL IMAGE PROCESSING</td>
<td>I-IV</td>
<td>a,b,c,d,e,f,g,h,i,j,k,l</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT011</td>
<td>UNIX INTERNALS</td>
<td>I,II,III</td>
<td>b,c</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT012</td>
<td>MOBILE TECHNOLOGIES</td>
<td>I,II,III</td>
<td>b,c</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT013</td>
<td>OPEN SOURCE SYSTEMS</td>
<td>I-IV</td>
<td>b,c,d,e,f,g,h,j</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT014</td>
<td>BIOINFORMATICS</td>
<td>I-IV</td>
<td>a,b,c,f</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT015</td>
<td>JAVA FRAMEWORKS</td>
<td>I-IV</td>
<td>a,b,c,e,g</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT016</td>
<td>ARTIFICIAL INTELLIGENCE</td>
<td>I-IV</td>
<td>a,b,c,d,e,f,g,h</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT017</td>
<td>USER INTERFACE DESIGN</td>
<td>I-IV</td>
<td>a,b,c,d,e,k</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT018</td>
<td>3D GAME PROGRAMMING</td>
<td>I-IV</td>
<td>b,c,e,k</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT019</td>
<td>ANIMATION FOR COMPUTER GRAPHICS</td>
<td>I-IV</td>
<td>a,c,e,k</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT020</td>
<td>USABILITY ENGINEERING</td>
<td>I-IV</td>
<td>a,b,d,e,g,l</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT021</td>
<td>E-COMMERCE</td>
<td>I-IV</td>
<td>d,e,f,k,l</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT022</td>
<td>ENTERPRISE RESOURCE PLANNING</td>
<td>I-IV</td>
<td>a,c,e,f,g,i,l</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT023</td>
<td>COMPREHENSION</td>
<td>I-IV</td>
<td>a,g</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT024</td>
<td>INFORMATION STORAGE MANAGEMENT</td>
<td>I,II,III</td>
<td>a,b,d,e</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT025</td>
<td>CLOUD INFRASTRUCTURE SERVICES</td>
<td>I-IV</td>
<td>b,e,f,g</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT026</td>
<td>ENTERPRISE RESOURCE PLANNING - BUSINESS APPLICATION PROGRAMMING I</td>
<td>I,II,III</td>
<td>a,b,c,d,e</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT027</td>
<td>ENTERPRISE RESOURCE PLANNING - BUSINESS APPLICATION PROGRAMMING II</td>
<td>I-IV</td>
<td>b,c,d,e,f,g</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT028</td>
<td>CLOUD COMPUTING</td>
<td>I-IV</td>
<td>a,c,d,e,f</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT029</td>
<td>CLOUD MANAGEMENT ESSENTIALS</td>
<td>I-IV</td>
<td>c,g</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT030</td>
<td>ENTERPRISE SYSTEM PROGRAMMING</td>
<td>I,II,III</td>
<td>a,c,d</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15GE001</td>
<td>ENTREPRENEURSHIP DEVELOPMENT I</td>
<td>II</td>
<td>b,c,d,e,f,&amp; k</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15GE002</td>
<td>ENTREPRENEURSHIP DEVELOPMENT II</td>
<td>II</td>
<td>b,e,h,ij,&amp; k</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15GE0P1</td>
<td>NANOMATERIALS SCIENCE</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15GE0P2</td>
<td>SEMICONDUCTOR PHYSICS AND DEVICES</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15GE0P3</td>
<td>APPLIED LASER SCIENCE</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15GE0C1</td>
<td>CORROSION SCIENCE</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15GE0C2</td>
<td>ENERGY STORING DEVICES AND FUEL CELLS</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15GE0C3</td>
<td>POLYMER CHEMISTRY AND PROCESSING</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT0YA</td>
<td>DATABASE MANAGEMENT SYSTEMS</td>
<td>I-IV</td>
<td>e,j,k,l</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT0YB</td>
<td>DATA STRUCTURES AND ALGORITHMS</td>
<td>I,II,III</td>
<td>c,d</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15IT0YC</td>
<td>DATA SCIENCES AND ANALYTICS</td>
<td>I,II,III</td>
<td>a,c,d</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ENTREPRENEURSHIP ELECTIVES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semesters</th>
<th>Module Code</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>15GE001</td>
<td>ENTREPRENEURSHIP DEVELOPMENT I</td>
<td>II</td>
<td>b,c,d,e,f,&amp; k</td>
<td>3 0 0 3</td>
</tr>
<tr>
<td>15GE002</td>
<td>ENTREPRENEURSHIP DEVELOPMENT II</td>
<td>II</td>
<td>b,e,h,ij,&amp; k</td>
<td>3 0 0 3</td>
</tr>
</tbody>
</table>

**PHYSICAL SCIENCE ELECTIVES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semesters</th>
<th>Module Code</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>15GE0P1</td>
<td>NANOMATERIALS SCIENCE</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
</tr>
<tr>
<td>15GE0P2</td>
<td>SEMICONDUCTOR PHYSICS AND DEVICES</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
</tr>
<tr>
<td>15GE0P3</td>
<td>APPLIED LASER SCIENCE</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
</tr>
<tr>
<td>15GE0C1</td>
<td>CORROSION SCIENCE</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
</tr>
<tr>
<td>15GE0C2</td>
<td>ENERGY STORING DEVICES AND FUEL CELLS</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
</tr>
<tr>
<td>15GE0C3</td>
<td>POLYMER CHEMISTRY AND PROCESSING</td>
<td>I,II</td>
<td>a</td>
<td>3 0 0 3</td>
</tr>
</tbody>
</table>

**OPEN ELECTIVES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semesters</th>
<th>Module Code</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>15IT0YA</td>
<td>DATABASE MANAGEMENT SYSTEMS</td>
<td>I-IV</td>
<td>e,j,k,l</td>
<td>3 0 0 3</td>
</tr>
<tr>
<td>15IT0YB</td>
<td>DATA STRUCTURES AND ALGORITHMS</td>
<td>I,II,III</td>
<td>c,d</td>
<td>3 0 0 3</td>
</tr>
<tr>
<td>15IT0YC</td>
<td>DATA SCIENCES AND ANALYTICS</td>
<td>I,II,III</td>
<td>a,c,d</td>
<td>3 0 0 3</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Name</td>
<td>Semesters</td>
<td>Components</td>
<td>Credits</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------</td>
<td>-----------</td>
<td>------------</td>
<td>---------</td>
</tr>
<tr>
<td>15IT0YD</td>
<td>OBJECT ORIENTED PROGRAMMING</td>
<td>I-IV</td>
<td>b,c,e,k</td>
<td>3</td>
</tr>
<tr>
<td>15IT0XA</td>
<td>ANDROID APPLICATION DEVELOPMENT</td>
<td>I-IV</td>
<td>b,c,e,l</td>
<td>3</td>
</tr>
<tr>
<td>15IT0XB</td>
<td>PYTHON ESSENTIALS</td>
<td>I,III,II</td>
<td>a,c,d</td>
<td>3</td>
</tr>
<tr>
<td>15IT0XC</td>
<td>PERL PROGRAMMING</td>
<td>I-IV</td>
<td>c,e,l</td>
<td>3</td>
</tr>
<tr>
<td>15IT0XD</td>
<td>GOOGLE APP SCRIPTING</td>
<td>I-IV</td>
<td>b,c,e,l</td>
<td>3</td>
</tr>
<tr>
<td>15GE0XA</td>
<td>HEALTH AND FITNESS</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15GE0XB</td>
<td>FOUNDATION COURSE IN COMMUNITY RADIO TECHNOLOGY</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15GE0XC</td>
<td>VEDIC MATHEMATICS</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15GE0XD</td>
<td>INTRODUCTION TO ALGORITHMS</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15GE0XE</td>
<td>ETYMOLOGY</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15GE0XF</td>
<td>HINDUSTANI MUSIC</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15GE0XG</td>
<td>CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15GE0XH</td>
<td>AGRICULTURE FOR ENGINEERS</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15GE0XI</td>
<td>INTRODUCTION TO DATA ANALYSIS USING SOFTWARE</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15GE0XJ</td>
<td>ANALYSIS USING PIVOT TABLE</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15ITB01</td>
<td>PROGRAMMING WITH C AND C++</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>15ITB02</td>
<td>ENGINEERING GRAPHICS</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
### SUMMARY OF CREDIT DISTRIBUTION

<table>
<thead>
<tr>
<th>S.No</th>
<th>CATEGORY</th>
<th>CREDITS PER SEMESTER</th>
<th>TOTAL CREDIT</th>
<th>CREDITS in %</th>
<th>Range of Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I   II  III  IV  V  VI  VII  VIII</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BS</td>
<td>Basic Sciences</td>
<td>7   12  4   3</td>
<td>26</td>
<td>15%</td>
<td>15% - 20%</td>
</tr>
<tr>
<td>ES</td>
<td>Engineering Sciences</td>
<td>9   8  4   3  4   4</td>
<td>32</td>
<td>18%</td>
<td>15% - 20%</td>
</tr>
<tr>
<td>HSS</td>
<td>Humanities and Social Sciences</td>
<td>6   3</td>
<td>3   2</td>
<td>14</td>
<td>8% - 10%</td>
</tr>
<tr>
<td>PC</td>
<td>Professional Core</td>
<td>15  15  12  8   11</td>
<td>61</td>
<td>35%</td>
<td>30% - 40%</td>
</tr>
<tr>
<td>PE</td>
<td>Professional Elective</td>
<td>15  15</td>
<td>12  8   11</td>
<td>27</td>
<td>16% - 15%</td>
</tr>
<tr>
<td>EEC</td>
<td>Employability Enhancement Course</td>
<td>6   6</td>
<td>6   9</td>
<td>16</td>
<td>9% - 15%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1   1  2   2  1   9</td>
<td>18</td>
<td>10%</td>
<td>10% - 15%</td>
</tr>
</tbody>
</table>

BS - Basic Sciences  
ES - Engineering Sciences  
HSS - Humanities and Social Sciences  
PC - Professional Core  
PE - Professional Elective  
EEC - Employability Enhancement Course  
CA - Continuous Assessment  
ES - End Semester Examination
15MA101 MATRICES AND CALCULUS 3 2 0 4
(Common to all Branches)

Course Objectives
Interpret the introductory concepts of Matrices and Calculus, which will enable them to model and analyze physical phenomena involving continuous changes of variables. Summarize and apply the methodologies involved in solving problems related to fundamental principles of Matrices and Calculus. Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Course Outcomes (COs)
Analyze the characteristics of a linear system with Eigen values and vectors. Identify and model the real time problem using first order linear differential equations. Recognize and solve the higher order ordinary differential equations. Characterize the functions and get the solutions of the same. Integrate the functions for evaluating the surface area and volume.

UNIT I MATRICES
9 Hours

UNIT II ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER
8 Hours

UNIT III ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER
11 Hours
Linear differential equations of second and higher order with constant coefficients. Linear differential equations of higher order with variable coefficients: Cauchy’s linear differential equation - Method of variation of parameters for second order differential equations.

UNIT IV MULTIVARIABLE CALCULUS
9 Hours
Functions of Two Variables and their solutions- Total Differential - Derivative of implicit functions- Jacobians Unconstrained maxima and minima.

UNIT V MULTIPLE INTEGRALS
8 Hours
Double integration with constant and variable limits-Region of integration -Change the order of integration - Area as double integral in cartesian coordinates. Triple integral in Cartesian coordinates.

FOR FURTHER READING
Applications of mass spring system in ordinary differential equations of higher order

Total: 45+30=75 Hours
Reference(s)


Erwin Kreyszig, Advanced Engineering Mathematics, Tenth Edition, Wiley India Private
Limited, New Delhi 2015.

India Private Limited, 2012.

New Delhi 2014.


T. Veerarajan, Engineering mathematics for First Year, Tata McGraw-Hill Publishing
company Limited, New Delhi, 2014.

Assessment Pattern

<table>
<thead>
<tr>
<th>UNIT/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

1. Define spectral values of a matrix.
   State Cayley - Hamilton theorem.
2. List out five natures of a quadratic form.
3. Reproduce the solution for the first order linear differential equation
   \[ \frac{dy}{dx} + Py = Q \]
5. Define Jacobian in three dimensions
7. List two sufficient conditions for extreme of a function
   \[ z = f(x, y) \] at \((a, b)\).
8. Define Jacobian of \( u \) and \( v \) with respect to \( x \) and \( y \).
9. Recall any two properties of Jacobians.

Understand

1. Identify whether there exists a square matrix without eigenvalues. Give reason
2. Indicate the matrix which has real eigenvalues and real eigenvectors.
3. Identify in which cases can we expect orthogonal eigenvectors.
4. Compare second and higher order ordinary differential equation
   A condenser of capacity \( C \) discharged through an inductance \( L \) and resistance \( R \) in series and the
   charge \( q \) at the time \( t \) satisfies the equation
   \[ \frac{d^2q}{dt^2} + \frac{dq}{dt} + \frac{q}{c} = 0 \]
   given that \( L=0.25 \).
henries, R=250 ohms, C=2\times10^{-6} \text{ farads}, and that when t=0, charge q is 0.002 coulombs and the current \( \frac{dq}{dt} = 0 \), obtain the value of q in terms of t.

Represent the area bounded by the parabolas y^2=4-x and y^2=4-4x as a double integral.

Formulate Leibnitz's equation where R=100 ohms, L=0.05 henry, E=100 \cos 300t volts.

A condenser of capacity C discharged through an inductance L and resistance R in series and the charge q at the time t satisfies the equation \( \frac{d^2 q}{dt^2} + \frac{R}{c} \frac{dq}{dt} + \frac{q}{C} = 0 \).

The circuit consists of an inductor of 1H, a resistor of 12Ω, capacitor of 0.01 F, and a generator having voltage given by \( E(t)=24 \sin 10t \).

Find the charge q and the current I at time t, if q=0 and i=0 at t=0 where \( i=\frac{dq}{dt} \).

Formulate the area between the curves y^2=4x and x^2=4y.

Indicate and change the order of integration for \( \int_{-1}^{2} \int_{-x}^{x} xy \, dy \, dx \).

Apply

1. Carry-out the three engineering applications of eigen value of a matrix.
2. Find the Eigen values and Eigen vectors of the matrix \( A = \begin{bmatrix} 1 & 1 \\ 7 & -2 \\ 10 & 4 \end{bmatrix} \) and hence find the Eigen values of \( A^2 \), 5A and \( A^{-1} \) using properties.
3. Use Cayley Hamilton theorem to find inverse of \( A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix} \).

Find the points of the function \( f(x, y) = x^2 y + xy^2 - axy \) where f is a maximum or minimum.

A body originally at 80°C cools down to 60°C in 20 minutes, the temperature of the air being 40°C. What will be the temperature of the body after 40 minutes from the original?

If the temperature of a cake is 300°F when it leaves the oven and is 200°F 10 minutes later, when will it be practically equal to the room temperature of 60°F, say, when will it be 61°F? Use Newton's law of cooling:\[ \frac{d^2 q}{dt^2} + \frac{R}{c} \frac{dq}{dt} + \frac{q}{C} = E \sin pt, \]
where \( i=\frac{dq}{dt} \). The circuit is tuned to resonance so that \( p^2 = \frac{1}{LC} \). If initially the current I and the charge q be zero. Show that, for small values of R/L, the current in the circuit at time t is given by \( \frac{Et}{2L} \sin pt \).

8. Construct the solution for the equation \( (D^3 - D)y = xe^x \).
9. Use the method of variation of parameters to solve \( x^2 y'' + xy' = x \) into a linear differential equation with constant coefficients.
10. Construct the equation for the equation \( (D^3 - D)y = xe^x \).
Analyze

1. Justify whether the matrix \( B = \begin{pmatrix} \cos \theta & \sin \theta & 0 \\ -\sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{pmatrix} \) is orthogonal or not?

Suppose that in winter the day time temperature in a certain office building is maintained at 70°F. The heating is shut off at 10 P.M. and turned on again at 6 A.M. On a certain day the temperature inside the building at 2 A.M. was found to be 65°F. The outside temperature was 50°F at 10 P.M. and had dropped to 40°F by 6 A.M. Find the temperature inside the building when the heat was turned on at 6 A.M.?

Experiment show that the radioactive substance decomposes at a rate proportional to the amount present. Starting with 2 grms at time \( t = 0 \) find the amount available at a later time.

In a circuit the resistance is 12Ω and the inductance is 4 H. The battery gives a constant voltage of 60 V and the switch is closed when \( t = 0 \), so the current starts with \( I(0) = 0 \). (a) Find \( I(t) \) (b) Find what happens to the current after a long time justify the current after 1 s.

9. If \( g(x, y) = \psi(u, v) \) where \( u = x^2 - y^2, v = 2xy \) prove that

\[
\frac{\partial^2 g}{\partial x^2} + \frac{\partial^2 g}{\partial y^2} = \left( \frac{\partial^2 \psi}{\partial u^2} + \frac{\partial^2 \psi}{\partial v^2} \right)
\]

10. Solve \( \int \int \int x dxdydz \).

Evaluate:

1. Use Cayley-Hamilton theorem to find the value of \( A^3 - 5A^2 + 7A - 3A = -5 + 7 - 3 + -5 + \ldots \) if the matrix \( A = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \).

2. Determine the nature, index, rank and signature by reducing the quadratic form \( 2x^2 + 2y^2 + 2z^2 + 2yz \) to canonical form by an orthogonal transformation.

3. Determine the value of \( y \) from the equation

4. Determine the solution of \( y \) of the equation

5. Determine the value of \( y \) from the equation

6. Determine the complete solution for \( y \) from

7. Determine the complete solution for \( y \) of

8. Determine the solution of the initial

9. Evaluate \( \int \int \int x dxdydz \) taken over the region of space defined by \( x^2 + y^2 \leq 1 \) and \( 0 \leq x \leq 1 \).

10. Evaluate \( \int \int x dxdy \) by changing into polar coordinates.
15PH102 ENGINEERING PHYSICS
(Common to all branches)

Course Objectives
To impart knowledge in properties of matter, crystallography and ultrasonics
To understand the applications of lasers and fiber optics
To implement the principles of quantum physics in the respective engineering fields

Course Outcomes (COs)
realize the concept of properties of matter and apply the same for practical applications
identify the suitable laser source for fiber optic communication applications
determine the velocity of ultrasonic waves and apply the same for day today applications
classify the different types of crystal structures and analyze their properties
comprehend the efficacy of quantum equations in modern areas

UNIT I
8 Hours
PROPERTIES OF MATTER

UNIT II
6 Hours
APPLIED OPTICS

UNIT III
5 Hours
ULTRASONICS

UNIT IV
5 Hours
SOLID STATE PHYSICS
Crystal Physics: lattice -unit cell -crystal systems- Bravais lattices- Miller indices- 'd' spacing in cubic lattice- calculation of number of atoms per unit cell, atomic radius, coordination number and packing density for SC, BCC, FCC and HCP structures- X-ray diffraction: Laue's method - powder crystal method.

UNIT V
6 Hours
QUANTUM MECHANICS
Quantum Physics: development of quantum theory- de Broglie wavelength -Schrodinger's wave equation- time dependent and time independent wave equations- physical significance. Application:

FOR FURTHER READING
Neutrons - expanding universe

INTRODUCTION
Exposure to Engineering Physics Laboratory and precautionary measures

EXPERIMENT 1
Determine the moment of inertia of the disc and calculate the rigidity modulus of a given wire using torsion pendulum (symmetrical masses method).

EXPERIMENT 2
Find the elevation of the given wooden beam at the midpoint by loading at the ends and hence calculate the Youngs modulus of the material.

EXPERIMENT 3
Find the depression at the midpoint of the given wooden beam for 50g, 100 g, 150 g, 200 g and 20 g subjected to non-uniform bending and determine the Youngs modulus of the material of the beam.

EXPERIMENT 4
Determine the coefficient of viscosity of the given liquid by Poiseulles method.

EXPERIMENT 5
Form the interference fringes from the air wedge setup and calculate the thickness of the given wire.

EXPERIMENT 6
By applying the principle of diffraction, determine the wavelength of given laser and the average particle size of lycopodium powder using laser source.

EXPERIMENT 7
Determine the wavelength of ultrasonics in a liquid medium, velocity of ultrasonic waves in the given liquid, compressibility of the given liquid using ultrasonic interferometer.

Total: 60 Hours

Reference(s)
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F 2 C 2</td>
<td>P 4 C 2 F</td>
<td>F 6 C</td>
<td>P 4 F</td>
<td>F 4 P</td>
<td>F C P M</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>F 2 C 2</td>
<td>P 2 6 F</td>
<td>P 2 4</td>
<td>F 4 P</td>
<td>F 4 P</td>
<td>F C P M</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>F 4 C 4</td>
<td>P 4 2 F</td>
<td>P 4 C</td>
<td>P 4 F</td>
<td>F 4 P</td>
<td>F C P M</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>F 2 C 2</td>
<td>P 4 2 P</td>
<td>P 5</td>
<td>F 5 C</td>
<td>P 5 F</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>F 2 C 2</td>
<td>P 4 4 F</td>
<td>P 4</td>
<td>F 4 C</td>
<td>P 4 F</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

Total 100

Assessment Questions

Remember

- Reproduce Hooke’s law
- Name the three types of moduli of elasticity
- List the two applications of air wedge
- Recall the two conditions required for achieving total internal reflection
- Define magnetostriction effect
- Recognize the four applications of ultrasonics in medical field
- Write the Bragg’s condition necessary for obtaining X-ray diffraction in crystals
- Retrieve the seven types of crystal system
- Recall four physical significance of wave function
- Define photoelectric effect

Understand

- Explain the procedure adopted for determining the Young’s modulus of the given material by non-uniform bending method
- Illustrate the effect of temperature on elasticity of a material
- Classify the fiber optics based on refractive index profile
- Indicate the role of optical resonators in the production of laser
- Compare the merits of magnetostriction and piezo-electric oscillators
- Summarize the four applications of ultrasonic waves in day-today life
- Identify the closely packed cubic crystal structure with an example
- Compare Laue method and powder crystal method used in X-ray diffraction
- Infer the significance of photoelectric effect
- Represent the two assumptions involved in solving the Schrödinger time dependent wave equation

Apply

1. Show that when a cylinder is twisted the torsional couple depends on torsional rigidity
2. Using torsional pendulum, explain the rigidity modulus of the wire
3. Design an EXPERIMENTal setup used for determining the thickness of a thin material
4. A silica optical fiber has a core refractive index of 1.50 and a cladding refractive index of 1.47. Find the numerical aperture for the fiber.
5. Construct the piezo electric oscillator circuit and explain the generation of ultrasonic waves
6. Find the depth of submerged submarine if an ultrasonic wave is received after 0.33 s from the time of transmission. (given v=1400 m/s)
7. Show that the axial ratio for an ideal HCP structure is 1.633
8. Sketch the planes having Miller indices (100) and (111).
9. Assess the various energy levels of an electron enclosed in a one dimensional potential well of finite width ‘a’
10. Compute the relation between de Broglie wavelength and velocity of a particle

Analyse

- Differentiate uniform bending from non-uniform bending
- Straight lined fringes are formed only in flat glass plates. Justify.
Conclude that the thickness of thin wire is influenced by band width of a material.
Outline the merits and demerits of magnetostriction oscillator method.
Five fold symmetry is not possible in crystal structures. Justify your answer.
Compare the degenerate state with non-degenerate state.

Evaluate
Determine the viscosity of a given liquid using Poiseuille’s method (Given: water, burette, stop clock, capillary tube, stand and travelling microscope).
When ultrasonic waves are passed through liquids, cavitations are produced. Criticize the statement.
Check the packing factor for a simple cubic structure is 0.52.
Evaluate the expression for time dependent Schroedinger’s wave equation.

15CH103 ENVIRONMENTAL SCIENCE

Course Objectives
realize the interdisciplinary and holistic nature of the environment
understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development
recognize the socio-economic, political and ethical issues in environmental science.

Course Outcomes (COs)
assess the importance of interdisciplinary nature of environment, its purpose, design and exploitation of natural resources
analyze the fundamental physical and biological principles that govern natural processes and role of professionals in protecting the environment from degradation.
identify the existing environmental challenges related to pollution and its management.
select suitable strategies and methods for sustainable management of environmental systems.
determine the impact of human activities on environment.

UNIT I
6 Hours
NATURAL RESOURCES

UNIT II
6 Hours
ECOSYSTEMS AND BIODIVERSITY

UNIT III
6 Hours
ENVIRONMENTAL POLLUTION
Pollution: Definition - causes - effects - control measures of air pollution - water pollution: (Sewage water treatment by activated sludge and trickling filter process) - marine pollution - thermal pollution.
UNIT IV
SOCIAL ISSUES AND ENVIRONMENT

UNIT V
HUMAN POPULATION AND ENVIRONMENT
Human population: Population growth - characteristics - variation among nations - population explosion - women and child welfare programmes - value education - HIV / AIDS. Role of information technology in environment and human health - occupational safety and health administration (OSHA)

FOR FURTHER READING
Human rights: E - waste and biomedical waste - Identification of adulterants in food materials

EXPERIMENT 1
General instructions to students for handling the reagents and safety precautions.

EXPERIMENT 2
Estimation of dissolved oxygen in a water sample/sewage by Winklers method

EXPERIMENT 3
Estimation of chloride content in water by argentometric method

EXPERIMENT 4
Estimation of calcium in lime by complexometric method

EXPERIMENT 5
Estimation of chromium in leather tannery effluents

EXPERIMENT 6
Determination of percentage purity of washing soda

EXPERIMENT 7
Estimation of heavy metals in the given solution by EDTA method

EXPERIMENT 8
Determination of Prussian blue dye concentration by spectrophotometer

Total: 60 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3  2  4  5</td>
<td>1  1  3  1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>4  1  4  7</td>
<td></td>
<td></td>
<td>1  2  1</td>
<td>1</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>3  4  6  2</td>
<td>1  1  1  1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>1  2  3  8 1</td>
<td>4  2  4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>1  2  2  5</td>
<td>1  1  3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
- Define the term bio-magnification.
- Name any four major gases responsible for air pollution.
- Recall four gases responsible for greenhouse effect.
- State environmental ethics.
- List any two impacts of water pollution.
- Mention the two objectives of value education.
- List any four consequences of air pollution on human health.
- Recall any two endangered and endemic species of India.
- List any two disadvantages of nuclear energy production.

Understand
- Summarize the structural and functional attributes of an ecosystem.
- With the help of neat flow chart explain waste water treatment process using activated sludge process.
- Explain the modern method of rain water harvesting technique diagrammatically and discuss the various strategies adopted for water conservation.
- Summarize the abstracts of Wildlife (protection) Act, 1972.
- Indicate the three consequences of noise pollution.
- Classify ecosystems on the basis of energy sources.
- Infer two types of photochemical reactions involved in formation and destruction of ozone in the stratosphere.
- Explain how the impacts of natural disasters can be minimized on human communities with on representative example.
- Summarize four major effects caused on forests and tribal people due to big dam construction.
- Infer the any two conflicts over water, confining to our nation.
- Identify three major threats to Indian biodiversity
- Relate the concept of food chain and food web with tropic level and mention their three significances.

Apply
- Identify any seven impacts caused if ground water is used enormously.
- Select the proper disaster management techniques that can be implemented to manage. a) Earthquake b) Floods
- Summarize the concept age-structure pyramids as a tool to achieve stabilized population in our nation.
Predict the significances of child welfare programmes in India.
Implement the 3R approach to manage solid waste.
Assess the four adverse effects of solid waste.
Assess how climate change affects human health.

**Analyze**
- Differentiate between confined and unconfined aquifers.
- Distinguish between critical and strategic minerals with two examples for each.
- Outline variations in population growth among nations with necessary diagram.
- “Day by day our atmosphere gets prone to serious effects” and “deterioration of environment affects human health”. Justify these two statements.
- Compare the major two advantages and limitations of the greenhouse pollutant CO2.

**Evaluate**
- Choose any one suitable method to minimize the impact of acid rain on environment.
- Determine the doubling time of population, if annual growth rate of a nation is 25 years.

---

**15GE205 BASICS OF CIVIL AND MECHANICAL ENGINEERING**

Common to CSE, ECE, EEE, EIE, FT, IT (I Semester) and to MTRS, BT, TT, FD (II Semester)

**Course Objectives**
- To impart basic knowledge in the field of Civil Engineering
- To guide students to select the good building materials
- To create awareness on various types of water supply and transportation systems
- To impart basic knowledge in the various engineering materials and manufacturing Processes.
- To understand the working principles of various Internal Combustion Engines, Refrigeration, Boiler and power plants.

**Course Outcomes (COs)**
- Understand the fundamental philosophy of Civil Engineering
- Identify the nature of building components, functions, construction practices and material qualities
- Understand the fundamental concepts of water supply and transportation systems
- Recognize the various engineering materials and understand the working principles and operations of manufacturing processes.
- Understand the working principles and operations of Internal Combustion Engines, Refrigeration, Boiler and power plants.

**UNIT I**

**INTRODUCTION TO CIVIL ENGINEERING**

History, development and scope of Civil Engineering Functions of Civil Engineers.
Construction Materials Characteristics of good building materials such as Stones Bricks -Cement - Aggregates and concrete. Surveying: Definition and purpose Classification Basic principles Measurement of length by chains and tapes.

**UNIT II**

**GENERAL FEATURES RELATING TO BUILDINGS**

Selection of site Basic functions of buildings Major components of buildings. Types of foundation Bearing capacity of soils General Principles of Brick masonry Stone masonry Beams Lintels Columns Doors and windows Introduction to Green Building and Interior Design
UNIT III
WATER SUPPLY AND TRANSPORTATION SYSTEMS

UNIT IV
ENGINEERING MATERIALS AND MANUFACTURING PROCESSES
Materials classification, mechanical properties of cast iron, steel and high speed steel Casting process-Introduction to green sand moulding, pattern, melting furnace electric furnace Introduction to metal forming process and types Introduction to arc and gas welding Centre lathe, Drilling and Milling machines principal parts, operations.

UNIT V
INTERNAL COMBUSTION ENGINES AND REFRIGERATION
Internal Combustion (IC) Classification, main components, working principle of a two and four stroke petrol and diesel engines, differences Refrigeration working principle of vapour compression and absorption system Introduction to Air conditioning.

UNIT VI
ENERGY, BOILERS, TURBINE AND POWER PLANTS
Energy-Solar, Wind, Tidal, Geothermal, Biomass and Ocean Thermal Energy Conversion (OTEC)Boilers classification, Babcock and Wilcox and La-Mont Boilers, differences between fire tube and water tube boiler Steam turbines- working principle of single stage impulse and reaction turbines Power plant classification, Steam, Hydel, Diesel, and Nuclear power plants.

Total: 45 Hours

Reference(s)
- M. S. Palanichamy, Basic Civil Engineering, TMH, 2009
- Pravin Kumar, Basic Mechanical Engineering, Pearson Education India, Pearson, 2013.
- S. R. J. Shantha Kumar, Basic Mechanical Engineering, Hi-tech Publications, Mayiladuthurai, 2015
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
<td>10</td>
<td></td>
<td></td>
<td>7</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>6</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
<td>6</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>12</td>
<td></td>
<td></td>
<td>6</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
- Classify Boiler.
- What are the uses of high carbon steel?
- Define welding
- Define soldering.
- Define Brazing.
- What do you mean by milling?
- Classify IC Engines.
- List the various components of IC Engines.
- Define Refrigeration.
- Classify Boiler.
- What is turbine?
- Define water tube boiler.
- Name the main parts of a turbine.
- Classify power plants.
- Writedown the scope of Civil Engineering.
- Define surveying.
- List the ingredients of concrete.
- State the basic principles of survey.
- What is meant by lintel?
- Write down the components of buildings.
- List the functions of foundation.
- What is meant by bearing capacity of soil?
- What are the factors to be considered in selection of site?
- Define gauges.
- Name the components of permanent way.
- State the importance of railway.
- List out the types of bridge.
- Write down the classification of highway.
- What do you meant by rain water harvesting
- What are the factors to be considered in design of green building?

Understand
- Compare reaction and impulse turbines.
- What is the difference between renewable and non-renewable sources of energy?
- What is the function of a hydraulic turbine?
- What is the function of a surge tank in Hydel power plant?
- What is the function of a moderator in Nuclear power plant?
- How to select the boiler?
- Why air is pre-heated before enter into boiler?
- How does a fusible plug function in boiler?
What is the function of a spark plug in IC engine?
What is the function of a fuel injector in diesel engine?
Compare and contrast 4 stroke and 2 stroke engine.
Describe the characteristics of good building stone.
Explain the various functions of Civil Engineer.
Discuss in detail about principles of surveying.
Describe the characteristics of cement and concrete.
Differentiate the English and Flemish bonds brick masonry.
What are the points to be observed in the construction of brick masonry?
Discuss about any four super structure components.
Distinguish between shallow and deep foundation.
Distinguish between stone and brick masonry.
Differentiate bituminous and cement concrete roads.
Elucidate the components of permanent way.
Describe the cross section of bituminous pavement.
Elucidate different sources of water supply.

Apply

Explain in detail about rain water harvesting.
Explain the process of water treatment.

**15GE106 C PROGRAMMING**

(Common to CSE, ECE, EEE, EIE, IT)

Course Objectives
Understand the basics of C primitives, operators and expressions.
Gain knowledge about the different primitive and user defined data types.
Impart knowledge about the structural programming concepts.

Course Outcomes (COs)
- Explore the basic C programming concepts.
- Develop programs using control statements.
- Exemplify the concepts of Arrays and strings in C.
- Implement the concepts of functions and pointers in C.
- Explore the concepts of structures, unions and files in C.

**UNIT I**
INTRODUCTORY CONCEPTS
C Primitives: Introduction to C - planning and writing a C program - Character Set - Keywords and Identifiers - Data Types - Variables and Constants - Compiling and executing the C program Operators and Expressions: Arithmetic - Relational - Logical - Increment and decrement - Conditional Bitwise - Comma - Sizeof() - Assignment - Shift operator - Precedence and order of evaluation – Type Conversion Input and Output Operations: Formatted I/O functions - getchar and putchar function - gets and puts functions

**UNIT II**
CONTROL STATEMENTS
Decision Making and Branching: simple if statement - if else statement - nesting of if else Statement - Switch Statement.
UNIT III  
ARRAYS AND STRINGS  
9 Hours  
Arrays: Introduction, one dimensional array, declaration - Initialization of one dimensional array, two-dimensional arrays, initializing two dimensional arrays, multi-dimensional arrays. Strings: Declaring and initializing string variables- Reading strings from terminal - writing string to screen - String handling functions.

UNIT IV  
FUNCTIONS AND POINTERS  
10 Hours  
User Defined Functions: Elements of user defined functions - Definition of functions - return values and their types - function calls - function declaration - categories of function - call by value and call by reference - recursion - Pre-processor directives and macros. Pointers: Understanding Pointers - accessing the address of the variable - declaring pointer variables - Initialization of pointer variables - Accessing a variable through its pointer

UNIT V  
STRUCTURES AND FILES  
10 Hours  

FOR FURTHER READING

4 Hours
EXPERIMENT 1
Write a C program to perform arithmetic operations on integers and floating point numbers.

4 Hours
EXPERIMENT 2
Write a C program to implement ternary operator and relational operators.

2 Hours
EXPERIMENT 3
Write a C program to read the values of A, B, C through the keyboard. Add them and after addition check if it is in the range of 100 to 200 or not. Print separate message for each.

2 Hours
EXPERIMENT 4
Write a C program to display the roots of a quadratic equation with their types using switch case.

2 Hours
EXPERIMENT 5
Write a C program to generate the following triangle.

1
1 2 3
1 2 3 4 5
1 2 3 4 5 6 7
EXPERIMENT 6
Write a C program to get a matrix of order 3x3 and display a matrix of order of 4x4, with the fourth row and column as the sum of rows and columns respectively.

4 Hours

EXPERIMENT 7
Write a c program to remove the occurrence of "the" word from entered string.

2 Hours

EXPERIMENT 8
Write a C program to find the factorial of given number.

4 Hours

EXPERIMENT 9
Design a structure to hold the following details of a student. Read the details of a student and display them in the following format Student details: rollno, name, branch, year, section, cgpa.

NAME:
ROLL NO:
BRANCH:
YEAR:
SECTION:
CGPA:

4 Hours

EXPERIMENT 10
Create two files test1.txt and test2.txt and write a C program to read the file test1.txt character by character on the screen and paste it at the end of test2.txt

4 Hours

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>20</td>
<td>21</td>
<td>21</td>
<td>22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total 100
Assessment Questions

Remember
List the rules for defining a variable.
State the associativity property of an operator.
List the three constructs for performing loop operations.
Recall return statement.
Define an array.
Recognize strings.
Define functions.
Define pointers.
Define a structure.
List the functions used for opening and closing a file.

Understand
Classify the operators in C.
Identify the functions used for formatted I/O in C.
Summarize the branching statements in C.
Summarize the looping statements in C.
Classify the types of arrays in C.
Summarize the string handling functions in C.
Exemplify call by value and call by reference.
Illustrate the pointer concepts in C.
Summarize the four storage classes.
Explain the concept of files in C.

Apply
Compute the greatest of two numbers using ternary operators in C.
Demonstrate the concept of type conversion in C.
Implement a C program to find the roots of a quadratic equation using Switch case statement.
Implement a C program to check whether a number is prime or not.
Compute matrix multiplication using two dimensional arrays in C.
Execute a C program to check whether a string is a palindrome or not.
Implement a C program using functions to find factorial of a number.
Implement a C program to use pointers in C.
Execute a C program to generate a pay slip for an employee using structures.
Implement a C program to copy the content of one file to the other.

Analysse
Differentiate getchar and putchar functions.
Differentiate while and do while loop in C.
Compare strupr and strlwr functions.
Differentiate function definition and function call.
Compare structure and union.

Evaluate
Determine the output of the following code:
```
#include
int main()
{
    int var = 010;
    printf("%d", var);
}
```
Determine the value of the logical expression a>b && a
Determine the output of the C code:
```
#include
```
int main()
{
    int a[5] = {5, 1, 15, 20, 25};
    int i, j, m;
    i = ++a[1];
    j = a[1]++;
    m = a[i++];
    printf("%d, %d, %d", i, j, m);
    return 0;
}

Determine the output of this C code. #include
int main()
{
    int a = 10, b =
    10; if (a = 5)
    b--; printf("%d, %d", a, b--);
}

Evaluate the expression c=(a+b*(c/d)%e) with a=10, b=3, c=5, d=6 and e=1

Create
Generate a structure to store the following details: Rollno, Name, Mark1, Mark2, Mark3, Total, Average, Result and Class. Write a program to read Rollno, name and 3 subject marks. Find out the total, result and class as follows:
   Total is the addition of 3 subject marks.
   Result is "Pass" if all subject marks are greater than or equal to 50 else "Fail".
   Class will be awarded for students who have cleared 3 subjects
      i. Class "Distinction" if average >=75
      Class "First" if average lies between 60 to 74 (both inclusive)
      Class "Second" if average lies between 50 & 59 (both inclusive)
   Repeat the above program to manipulate 10 students’ details and sort the structures as per rank obtained by them.
Create a structure that can describe the employees with the fields Eno, Ename, Basic. Write a program to calculate DA = 32% of Basic, HRA = 15% of Basic. CCA = 10% of BASIC, PF = 15% of Basic and print all details with Net pay. All processing should be using pointer notation.
   Result is "Pass" if all subject marks are greater than or equal to 50 else "Fail".
   Class will be awarded for students who have cleared 3 subjects
      i. Class "Distinction" if average >=75
      Class "First" if average lies between 60 to 74 (both inclusive)
      Class "Second" if average lies between 50 & 59 (both inclusive)
   Repeat the above program to manipulate 10 students’ details and sort the structures as per rank obtained by them.

15GE207 ENGINEERING GRAPHICS
Common to CE, CSE, ECE, EEE, EIE, IT (I Semester);
AE, AG, AU, ME, MTRS, BT, FT, TT, FD (II Semester)

Course Objectives
To learn conventions and use of drawing tools in making engineering drawings.
To understand the engineering drawing methods and procedures to draw two dimensional drawings from three dimensional model and vice versa.

To provide the practice for converting simple drawing into the computer aided drawing.

**Course Outcomes (COs)**

- Recognize the conventions and apply dimensioning concepts while drafting simple objects.
- Develop the two dimensional drawings from three dimensional model and vice versa.
- Utilize the visualization skill to convert simple drawing into the computer aided drawing.

**CONVENTIONS AND BASIC DRAWINGS**

Importance - conventions - ISO and BIS - drawing tools and drawing sheets - lettering, numbering, dimensioning, lines and symbols - Conic sections-types constructions-ellipse, parabola and hyperbola - eccentricity and parallelogram method.

**PROJECTIONS**

Principles - first and third angle projections - Points - first angle projection of points Straight lines - parallel, perpendicular and inclined to one reference plane - Solid - cylinders, pyramids, prisms and cones - perspective projections.

**ORTHOGRAPHIC PROJECTIONS AND SECTION OF SOLIDS**

Orthographic Projections - concepts - front view, top view and side view of simple solids - Section of Solids - simple illustrations.

**ISOMETRIC PROJECTIONS AND DEVELOPMENT OF SURFACES**

Importance - orthographic to isometric projection - simple and truncated solids. Development of surfaces - cylinders, pyramids, prisms, cones and simple truncated objects.

**INTRODUCTION TO AUTOCAD**

Basics commands of AutoCAD - two dimensional drawing, editing, layering and dimensioning - coordinate systems - Drawing practice - orthographic views of simple solids using AutoCAD.

Total: 60 Hours

**Reference(s)**

15MA201 VECTOR CALCULUS AND COMPLEX ANALYSIS
(Common to all Branches)

Course Objectives
Implement the Complex Analysis, an elegant method in the study of heat flow, fluid dynamics and electrostatics.
Summarize and apply the methodologies involved in solving problems related to fundamental principles of Calculus viz: Differentiation, Integration and Vectors.
Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Course Outcomes (COs)
Characterize the calculus of vectors.
Apply the theoretical aspects of vector integral calculus in their core areas.
Recognize the differentiation properties of complex functions.
Identify the complex functions and their mapping in certain complex planes.
Use the concepts of integration to complex functions in certain regions.

UNIT I
VECTOR CALCULUS
10 Hours
Gradient -Divergence -Curl - Directional derivative- Solenoidal -Irrotational vector fields -Line Integral -Surface integrals.

UNIT II
INTEGRAL THEOREMS OF VECTOR CALCULUS
9 Hours
Green's theorem in a plane- Stoke's Theorem- Gauss divergence theorem- Applications involving cubes and parallelepiped.

UNIT III
ANALYTIC FUNCTIONS
8 Hours

UNIT IV
MAPPING OF COMPLEX FUNCTIONS
8 Hours
Physical interpretation of mapping- Application of transformation: translation, rotation, magnification and inversion of multi valued functions - Linear fractional Transformation (Bilinear transformation).

UNIT V
INTEGRATION OF COMPLEX FUNCTIONS
10 Hours
Cauchy's Fundamental Theorem - Cauchy's Integral Formula - Taylor's and Laurent's series-Classification of Singularities - Cauchy's Residue Theorem.

FOR FURTHER READING
Applications to Electrostatic and Fluid Flow.

Total: 45+30=75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>UNIT/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>6</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td></td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td></td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

Define gradient of a vector.
Define irrotational of a vector.
State Green’s theorem.
State Gauss divergence theorem.
Check whether the function is $f(z)=z^3$ analytic.
List the necessary condition for a function $f(z)$ to be analytic.
Define bilinear transformation.
State the condition for the transformation $w = f(z)$ to be conformal at a point.
State the formula for finding the residue of a double pole.
State Cauchy’s integral formula.

Understand

1. If $F = x^2 \hat{i} + xy \hat{j}$ evaluate the line integral $\int F \cdot dr$ from $(0,0)$ to $(1,1)$ along the path $y=x$.

   Identify the unit normal vector to the surface $x^2 + xy + z^2 = 4$ at the point $(1,-1,2)$.

   Identify the value of $\nabla x \nabla \Phi(F)$, using Stoke’s theorem.

   Formulate the area of a circle of radius $a$ using Green’s theorem.

   Illustrate the two properties of analytic function.

   Represent the analyticity of the function $w = \sin z$.

2. Identify fixed points of the transformation $w = z^2$.

   Identify the image of the triangular region in the $z$ plane bounded by the lines $x=0$, $y=0$, and $x+y=1$ under the transformation $w = 2z$.

8. Infer $\int_{c} \frac{dz}{z-3}$ where $c$ is the circle $|z|=1$. 
9. Identify the residues of the function \( f(z) = \frac{4}{z^2(z-2)} \) at its simple pole.

**Apply**

1. Find \( \int C \mathbf{F} \cdot d\mathbf{r} \) where \( \mathbf{F} = (2y + 3)i + xzj + (yz - x)k \) along the line joining the points \((0,0,0)\) to \((2,1,1)\).

2. If \( \mathbf{F} = 3xyi - y^2j \), find \( \int C \mathbf{F} \cdot d\mathbf{r} \) where \( C \) is the curve in the xy-plane \( y = 2x^2 \) from \((0,0)\) to \((1,0)\).

3. Apply Green’s theorem in the plane to Compute \( \int \int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy \) where \( C \) is the boundary of the region defined by \( x = 0, y = 0 \) and \( x+y = 1 \).

4. Using Gauss divergence theorem, Compute \( \oiint_S \mathbf{F} \cdot d\mathbf{s} \) where \( \mathbf{F} = 4xzj - y^2j + yzk \) and \( S \) is the surface of the cube bounded by \( x = 0, y = 0, z = 0, x = 1, y = 1, z = 1 \).

5. If \( \omega = \phi + iv \) represent the complex potential for an electric field and \( \psi = x^2 - y^2 + \frac{x}{x^2 + y^2} \), find the function \( \phi \).

6. If \( u = \log(x^2 + y^2) \), find \( v \) and \( f(z) \) such that \( f(z) = u + iv \) is analytic. Find bilinear transformation which maps the points \( I, -1, I \) of the \( z \) plane into the points \( 0, 1, \infty \) of the \( w \) plane respectively.

7. Find the image of the circle \( z - 1 = 1 \) in the complex plane under the transformation \( w = \frac{1}{z} \).

8. Find Taylor’s series \( f(z) = \cos z \) about \( z = \frac{\pi}{4} \).

10. Find the nature of singularity \( z e^{\frac{1}{z^2}} \).

**Analyze**

Conclude div grad \( \mathbf{r}^n = \nabla \cdot (\mathbf{r}^n) = n(n+1)\mathbf{r}^{n-2} \).

Demonstrate the irrotational vector and solenoidal vector with an example.

3. Justify stokes’ theorem for \( \mathbf{F} = -yi + 2yzj + y^2k \), where \( S \) is the upper half of the sphere \( x^2 + y^2 + z^2 = 1 \).

4. Justify Gauss divergence theorem for \( \mathbf{F} = x^2i + y^2j + z^2k \) where \( S \) is the surface of the cuboid formed by the planes \( x = 0, x = a, y = 0, y = b, z = 0 \) and \( z = c \).

The complex potential \( f(z) = z^2 \) describes a flow with constant equipotential lines and streamlines. Determine the velocity vector.

Show that the function \( u = x^2 + x_2 - 3xy_2 + 2xy - y_2 \) is harmonic and find the corresponding analytic function.

Find the image of the rectangle whose vertices are \((0,0), (1,0), (1,2), (0,2)\) by means of linear transformation \( w = (1+i)z + 2 - i \). Also compare the images.

8. Generate \( f(z) = \frac{z}{(z-1)(z-3)} \) as Laurent’s series valid in the regions: \( 1 < z < 3 \) and \( 0 < |z-1| < 2 \).
9. Use Cauchy’s integral formula Compute \( \int_{C} \frac{e^{z}}{z + 2} \left( z + 1 \right) \frac{dz}{z + 1} \) where C is the circle \( |z| = 3 \).

10. Find \( \int_{C} \frac{z + 4}{z^{2} + 2z + 5} \) where C is \( |z| = 2 \).

Evaluate

1. Determine \( \iint_{S} ( xdydz + 2ydzdx + 3zdxdy ) \), where S is the closed surface of the sphere \( x^{2} + y^{2} + z^{2} = a^{2} \).

   Prove that \( \text{curl(curl} F) = \text{grad(div} F) - \nabla^{2} F \).

   Check Stokes theorem for \( F = \left( x^{2} + y^{2} \right)i - 2xyj \) taken around the rectangle bounded by \( x=\pm a, y=0, y=b \).

4. Check Green’s theorem in the plane to determine \( \int_{C} \left( 3x^{2} - 8y^{2} \right)dx + (4y - 6xy) dy \) where C is the boundary of the region defined by \( (i) x=0, y=0, x+y=1 \) and \( y=x^{2} \).

5. Determine the analytic function \( f(z) = P + iQ \), if \( Q = \cos 2x \sin 2y \), if \( f(0) = 1 \).

   Determine \( f(z) \) and the conjugate harmonic \( v \) such that \( w = u + iv \) is an analytic function of \( z \) given that \( u = e^{x^{2} - y^{2}} \cos 2xy \).

   Determine the image of the infinite strip \( -1 \leq y \leq 1 \) under the transformation \( w = \frac{z}{z^{2} + 2} \).

8. Determine the Laurent’s series expansion \( f(z) = \frac{z^{1}}{(z + 2)(z + 3)} \) for \( 2 < |z| < 3 \).

9. Determine \( \int_{C} \frac{z + 4}{z^{2} + 2z + 5} \) where C is \( |z + 1 + i| = 2 \).

10. Using Cauchy’s integral formula determine \( \int_{C} \frac{e^{z} dz}{(z + 2)(z + 1)} \) where C is \( |Z| = 1 \).

15GE105 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING 2023

(Common to AE, AG, AU, CE, ME, MTRS, BT, TT, FD (I Semester) and to CSE, FT, IT (II Semester))

Course Objectives

To understand the basic concepts of electric circuits and magnetic circuits.

To illustrate the construction and operation of various electrical machines and semiconductor devices.

To learn the fundamentals of communication systems.
Course Outcomes (COs)

Understand the basic concepts of electric and magnetic circuits.
Summarize the types of DC machines.
Classify the static and dynamic AC machines and explain their operation.
Interpret the operation of AC and DC drives.
Illustrate the characteristics of semiconductor devices and communication systems.

UNIT I 7 Hours

ELECTRIC CIRCUITS

UNIT II 5 Hours

DC MACHINES

UNIT III 6 Hours

AC MACHINES

UNIT IV 5 Hours

ELECTRICAL DRIVES
Speed control of dc shunt motor and series motor - Armature voltage control - Flux control - Construction and operation of DC servo motor - Construction and operation of DC servo motor stepper motor.

UNIT V 7 Hours

ELECTRON DEVICES AND COMMUNICATION
Characteristics of PN Junction diode and Zener diode - Half wave and Full wave Rectifiers - Bipolar Junction Transistor - Operation of NPN and PNP transistors - Logic gates - Introduction to communication systems.

FOR FURTHER READING
Voltage Regulator - Stepper motor - Energy meter - SMPS, Satellite and Optical communication.

EXPERIMENT 1
Analyze the VI characteristics of a fixed resistor and a lamp by varying its temperature.

EXPERIMENT 2
Apply the voltage division and current division techniques for series and parallel connections of lamp loads.

EXPERIMENT 3
Understand the concept of electromagnetic induction using copper coil.
EXPERIMENT 4
Understand the construction and working principle of DC machines.

4 Hours

EXPERIMENT 5
Determine the VI Characteristics of PN Junction diode and plot the input and output wave shapes of a half wave rectifier.

6 Hours

EXPERIMENT 6
Realize the working of transistor as an electronic switch through experiments.

4 Hours

EXPERIMENT 7
Lighting applications using logic gates principle.

4 Hours

Total: 60 Hours

Reference(s)
Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, Prentice Hall (India) Pvt. Ltd., 2010

Assessment Pattern

<table>
<thead>
<tr>
<th>UNIT/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M F</td>
<td>C P M F C P M F</td>
<td>C P M F</td>
<td>C P M F</td>
<td>C P M F</td>
<td>C P M F</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
State Kirchhoff’s current law.
State Ohm’s law.
State Kirchhoff’s voltage law.
State Faraday’s law of electromagnetic induction.
Give the properties of flux lines.
Define reluctance.
Define magnetic flux.
State the operating principle of a transformer.
State the operating principle of DC generator.
What is back emf?
State the operating principle of DC Motor.
State Fleming’s Left hand rule.
State Fleming’s Right hand rule.
Sketch the V-I characteristics of zener diode.
What is junction barrier?
What is BJT?
List the applications of optical fibre communication.
Define aspect ratio.

**Understand**

Define average value.
Compare series and parallel circuits.
Why domestic appliances connected in parallel?
Classify the magnetic circuits.
Describe the concepts of self and mutually induced emf.
What is leakage coefficient?
Interpret the laws of electromagnetic induction.
Elucidate the working principle of a transformer.
What is DC generator?
List the applications of DC motors.
Illustrate the construction and working principle of three phase induction motor.
Outline the applications of DC generators.
Demonstrate the action of diode in forward and reverse biasing.
Explain the operation of NPN transistor.
Draw symbol of diode and zener diode.
Illustrate the input and output characteristics of CE configuration.
Exemplify the need for modulation.
Summarize the advantages of FM over AM.
State the need for modulation.
Discuss the principle of frequency modulation.

**Apply**

Three resistors are connected in series across a 12V battery. The first resistance has a value of 2 Ω, second has a voltage drop of 4V and third has power dissipation of 12 W. Calculate the value of the current in the circuit.

A 25 Ω resistor is connected in parallel with a 50 Ω resistor. The current in 50 Ω resistor is 8A. What is the value of third resistance to be added in parallel to make the total line current as 15A?

The self-inductance of a coil of 500 turns is 0.25H. If 60% of the flux is linked with a second coil of 10500 turns. Calculate a) the mutual inductance between the two coils and b) emf induced in the second coil when current in the first coil changes at the rate of 100A/sec.

4. An air cored toroidal coil has 480 turns, a mean length of 30cm and a cross-sectional area of 5 cm$^2$. Calculate a) the inductance of the coil and b) the average induced emf, if a current of 4 A is reversed in 60 milliseconds.

toroidal air cored coil with 2000 turns has a mean radius of 25cm, diameter of each turn being 6cm. If the current in the coil is 10A, find mmf, flux, reluctance, flux density and magnetizing force.

Construct the circuit of voltage regulator.
Outline the applications of DC motors.
Develop the block diagram of the television and explain each block.
Build the circuit of full wave bridge rectifier.
Develop the block diagram of the optical fibre communication and explain each block.
Construct the circuit of half wave rectifier.

Analyse

Analyze the voltage, current and power in a resistor supplied with an alternating voltage. Obtain the equations for the equivalent star network resistances for a given delta network.
Derive the expression for RMS, average value, peak and form factor of sinusoidal voltage. Analyze the voltage, current and power relationship in three phase star connected system. Derive the expressions for self-inductance and mutual inductance. Analyze the series and parallel magnetic circuit and derive the total mmf required. Compare electric and magnetic circuits. Derive the emf equation of DC Generator. Obtain the expression for current amplification factor. Derive the expression of ripple factor, efficiency of full wave bridge rectifier.

Evaluate

Estimate the value of mesh currents in the following network.

For the circuit in Fig. determine $i_X$ and compute the power dissipated by the 15-kΩ resistor.

3. Estimate the value of node voltage in the following network.

An iron rod of 1 cm radius is bent to a ring of mean diameter 30 cm and wound with 250 turns of wire. Assume the relative permeability of iron as 800. An air gap of 0.1 cm is cut across the bent ring. Calculate the current required to produce a useful flux of 20,000 lines if leakage is neglected. The effective resistance of two resistors connected in series is 100 Ω. When connected in parallel, then effective value in 24 ohm’s. Determine the value of two resistors. Determine the equivalent resistance of the following circuit.

7. Calculate the total resistance $R_T$, and total current $I$ in the following circuits using star-delta.
transformation technique

Create

Create the circuit diagram of 5V regulated power supply.
Plan the combinational circuit diagram of EX-NOR gate using NOR gate.

15IT206 PROGRAMMING USING C++
3024
(Common to CSE and IT)

Course Objectives
- Understand the concept of Object Oriented Programming
- Apply the Object oriented concepts to solve problems using C++
- Develop programs using files and templates

Course Outcomes (COs)
- Understand the concepts of classes and objects
- Develop programs using Overloading
- Apply various types of inheritance
- Implement the concepts of functions and streams
- Develop programs using files, templates and exception handling

UNIT I
CLASSES AND OBJECTS
9 Hours
Need for object oriented programming - Characteristics of object oriented programming - Classes and Objects: Simple Class - Nesting of Member functions - Static Data Members and Member Functions - Constructors and Destructors - Returning Objects from Functions.

UNIT II
ARRAYS, STRINGS AND OVERLOADING
9 Hours

UNIT III
INHERITANCE
9 Hours
Derived Class and Base Class - Derived Class Constructors - Overriding Member Functions - Public and Private Inheritance - Types of Inheritance: Single, Multi Level, Multiple, Hierarchical and Hybrid - Virtual Base Classes - Abstract Classes.

UNIT IV
FUNCTIONS AND STREAMS
8 Hours
Pointers - this Pointer - Pointers to Objects and Derived Classes - Function Overloading - Virtual Function - Friend Function - Static Function - Streams: Stream Classes - Unformatted I/O Operations - Formatted Console I/O Operations.
UNIT V  
FILES, STREAMS AND EXCEPTION HANDLING

FOR FURTHER READING
Payroll system using polymorphism - Integrated grade book for students using arrays - Virtual destructor - Proxy classes.

EXPERIMENT 1
Implementation of operator overloading with class and objects.

EXPERIMENT 2
Implementation of types of Inheritance.

EXPERIMENT 3
Implementation of two different classes for adding a private data member using friend function.

EXPERIMENT 4
Implementation of operator and function overloading.

EXPERIMENT 5
Implementation of file handling operations.

EXPERIMENT 6
Implementation of Class templates and Function templates.

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F 2</td>
<td>C 1</td>
<td>M 1</td>
<td>F 1</td>
<td>C 1</td>
<td>M 1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>F 2</td>
<td>C 3</td>
<td>M 1</td>
<td>F 3</td>
<td>C 3</td>
<td>M 1</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>F 3</td>
<td>C 1</td>
<td>M 1</td>
<td>F 2</td>
<td>C 1</td>
<td>M 1</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>F 4</td>
<td>C 1</td>
<td>M 1</td>
<td>F 1</td>
<td>C 1</td>
<td>M 1</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>F 4</td>
<td>C 2</td>
<td>M 1</td>
<td>F 3</td>
<td>C 1</td>
<td>M 2</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
</tr>
</tbody>
</table>
Assessment Questions

Remember
Write the features of object-oriented programming.
Recall the types of constructors.
How constructor is declared and defined?
Give the advantages of dynamic initialization.
Name the types of pre-defined exceptions.
What are the operators not possible to overload?
List the advantages of virtual function.
What is abstract class?
State the use of catch block.
Describe the need for friend functions.

Understand
Data items in a class must be private – Justify.
Is it possible to overload a constructor? Justify.
Contrast the overloading and overriding.
Differentiate multiple and hierarchical inheritance.
Indicate how to create manipulators.
Contrast Function template with class Template.
Give the syntax to define a friend function.
What are the operators that cannot be overloaded in C++.
Mention the advantages of polymorphism.
What is the necessity of operator overloading?

Apply
1. Demonstrate how to implement the runtime polymorphism using C++
2. How do you differentiate a constructor from an ordinary function?
3. How to create an array using new operator?
4. Define a class called data that has private members declared. Associate a mechanism to access these private members in another function.
5. Create a C++ program to calculate the net/gross salary of an employee depending upon the allowances he is subject to according to the laws of India.
6. Write a C++ code to implement polymorphism.
7. Illustrate the use of new and delete functions.
8. With a sample program illustrate how to destroy an object created using a constructor.

Analyse
Compare class template and function template.
Justify how structure is different from classes.
Differentiate with example for operator and function overloading.
Identify the functionalities of File Pointers.
Illustrate the Limitation of array of Static Function.
Distinguish between OOP and Structured Programming.

Evaluate
Defend the steps involved in Exception handling.
Summarize the various built in String functions available in C++.
Support with example for Character I/O streams.
Evaluate the guidelines for finding file path.

Create
Write a bank application using class and objects.
Create an application for scientific calculator using inheritance.
Create a stack operation using function templates.
Generate the pseudo code for Friend Function and Virtual Function.

15GE107 WORKSHOP PRACTICE

Common to AE, AG, AU, ME, MTRS, BT, FT, TT, FD (I Semester);
CE, CSE, ECE, EEE, EIE, IT (II Semester)

Course Objectives

To provide hands on training for fabrication of components using carpentry, sheet metal, fitting and welding equipment/tools.
To develop the skills for preparing the green sand mould using foundry tools and to make simple electrical & household pipe line connections using suitable tools.
To develop the skill to make / operate/utilize the simple engineering components.

Course Outcomes (COs)

Fabricate simple components using carpentry, sheet metal, fitting & welding equipment/tools.
Prepare green sand mould and make simple electrical & household pipe line connections using suitable tools.
Make / operate / utilize the simple engineering components

EXPERIMENT 1
Forming of simple object in sheet metal using suitable tools (Example: Dust Pan / Soap Box) (or) making simple object using Metal Spinning Machine. (Example: Aluminum Cup).

EXPERIMENT 2
Prepare V (or) Half round (or) Square (or) Dovetail joint from the given mild Steel Flat.

EXPERIMENT 3
Fabrication of a simple component using thin and thick plates. (Example: Book rack)

EXPERIMENT 4
Making a simple component using carpentry power tools. (Example: Electrical switch Box/Tool box/ Letter box).

EXPERIMENT 5
Construct a household pipe line connections using pipes, Tee joint, Four way joint, elbow, union, bend, Gate way and Taps (or) Construct a pipe connections of house application centrifugal pump using pipes, bend, gate valve, flanges and foot valve.

EXPERIMENT 6
Prepare a green sand mould using solid pattern/split pattern.

EXPERIMENT 7
Construct a domestic electrical wire connections using indicator, one way switch with calling bell, two way switch with lamp, one way switch with fan regulator and one way switch with socket.

EXPERIMENT 8
Study of computer components, assembling and disassembling of computer system.
EXPERIMENT 9
Installation of Windows and Linux operating systems in PC
2 Hours

EXPERIMENT 10
Network configuration and trouble shooting in Windows and Linux
2 Hours

Total: 30 Hours

15MA301 FOURIER SERIES AND TRANSFORMS
(Common to all branches of B.E./B.Tech. except CSE)

Course Objectives
To understand the concepts of Fourier series, Transforms and Boundary Conditions, which will enable them to model and analyze the physical phenomena
To implement the Fourier analysis, an elegant method in the study of heat flow, fluid mechanics and electromagnetic fields.
To summarize and apply the mathematical aspects that contribute to the solution of one dimensional wave equation
To develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Course Outcomes (COs)
Recognize the periodicity of a function and formulate the same as a combination of sine and cosine using Fourier series.
Formulate a function in frequency domain whenever the function is defined in time domain.
Apply the Fourier transform, which converts the time function into a sum of sine waves of different frequencies, each of which represents a frequency component.
Classify a partial differential equation and able to solve them.
Use the Z-transform to convert a discrete-time signal, which is a sequence of real or complex numbers, into a complex frequency domain representation.

UNIT I
FOURIER SERIES
Dirichlet's conditions - General Fourier series - Odd and even functions - Half range cosine and sine series - Root mean square value.

UNIT II
LAPLACE TRANSFORM
Laplace Transform - Existence Condition - Transforms of Standard Functions - Unit step function, Unit impulse function - Properties - Transforms of Derivatives and Integrals - Initial and Final Value Theorems - Laplace transform of Periodic Functions - Inverse Laplace transforms.

UNIT III
FOURIER TRANSFORM
Fourier Integral Theorem - Fourier Transform and Inverse Fourier Transform - Sine and Cosine Transforms - Properties - Transforms of Simple Functions - Convolution Theorem - Parseval's Identity
UNIT IV
APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

UNIT V
Z-TRANSFORM

FOR FURTHER READING
Solutions of one dimensional wave equation and heat equations using Laplace transforms method.

Total: 45+30=75 Hours

Reference(s)

Assessment Pattern

| UNIT/RBT | F | C | P | M | F | C | P | M | F | C | P | M | F | C | P | M | Total |
|----------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| 1        | 2 | 2 | 2 | 6 | 6 | 6 |   |   |   |   |   |   |   |   |   | 22  |
| 2        | 2 | 2 | 6 | 6 | 6 | 6 |   |   |   |   |   |   |   |   |   | 26  |
| 3        | 2 | 2 | 6 | 6 | 6 |   |   |   |   |   |   |   |   |   |   | 16  |
| 4        | 2 | 6 | 6 | 6 |   |   |   |   |   |   |   |   |   |   |   | 20  |
| 5        | 2 | 2 | 6 |   | 6 |   |   |   |   |   |   |   |   |   |   | 16  |
| **Total**|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 100 |

Assessment Questions
Remember
1. State the Dirichlet’s Conditions.
   Define even and odd function graphically.
   List out the complex Fourier transform pair.
   State convolution theorem in Fourier transforms.
   Label the condition for the existence of Laplace Transform.
   Reproduce L (t sin at).
State the final value theorem for Laplace Transform.

Label the inverse Laplace Transform of \( \frac{1}{1/(s^2 + w^2)^2} \).

9. Recognize \( f(n + 1) \) in terms of \( f(z) \) and evaluate it.

10. Summarize Z-transform.

Understand

1. Infer the half-range cosine series for the function \( f(x) = x, \quad 0 < x < \pi \).

2. Find the Fourier transform of \( \frac{x}{\pi(2 - x)} \).

3. Identify the Fourier transform of \( |x| \) for \( |x| \leq 1 \). Hence evaluate \( \frac{x}{\pi} \sin x \) and \( \frac{\delta(x)}{\pi} \sin x \).

4. Illustrate the Fourier Sine and Cosine transform of \( e^{-ax} \) and evaluate \( \frac{\pi}{\sin \alpha} \) and \( \frac{\pi}{\cos \alpha} \).

5. Exemplify \( \int_0^{\pi} \sin u \cos(t-u) \, du \) using Laplace Transform.

6. Indicate the inverse Laplace transform of \( \frac{z}{(z-1)(z-2)(z-3)} \) by the method of partial fraction.

7. Use convolution theorem to find the inverse Laplace transform of \( \frac{z}{(z-1)(4z+1)} \).

Classify the possible solutions of one dimensional wave equation.

Apply

1. Execute the function \( f(x) = \cos \frac{x}{2\pi} \) in \( (-\pi, \pi) \) to represent as a Fourier series of periodicity \( 2\pi \).

A taut string of length L is fastened at both ends. The midpoint of the string is taken to a height of \( b \) and then released from rest in this position. Find the displacement of the string at any time \( t \).

3. Find the Fourier transform of \( \left( \frac{\sin x}{x} \right)^4 \) for \( x > \alpha \).

4. Find the Fourier transform of \( \left( \frac{\sin x}{x} \right)^2 \) and \( \left( \frac{\sin x}{x} \right)^4 \) for \( x > \alpha \).

5. Verify the initial and final value theorem for the function \( 1 + e^{-2t} \).

6. Using Convolution theorem find the inverse Laplace transform of \( \frac{1}{s^2 (s^2 + 2s)} \).

8. Find \( L^{-1}\left( \frac{p^2 - p + 2}{p(p + 2)(p - 3)} \right) \) using Partial fraction method.

9. Using Convolution theorem evaluate \( e^{\pi} \left( \frac{z^2}{(z-1)(z-3)} \right) \).
10. Solve the differential equation
\[ y(n+3) - 3y(n+1) + 2y(n) = 0 \text{ given that } y(0) = 4, y(1) = 0 \text{ and } y(2) = \]

\[ . \]

**Analyze**

1. Organize the sine series for
\[ f(x) = \begin{cases} x & \text{in } 0 < x < \frac{l}{2} \\ l-x & \text{in } \frac{l}{2} < x < l \end{cases} \text{ in the interval } (0, l). \]

A tightly stretched string of length ‘l’ fastened at both ends. The mid-point of the string taken to a height ‘b’ and show that the displacement at any time ‘t’ is given by
\[ y(x, t) = \frac{8b}{\pi} \sum_{n=1}^{\infty} \left[ \frac{1}{n} \cos \frac{n\pi}{2} \left( \frac{1}{2} \cos \frac{n\pi}{2} - \cos \frac{3n\pi}{2} \right) \right] \sin \left( \frac{n\pi}{2} \right) x. \]

3. Organize the Fourier transform of \( f(x) \) given by
\[ L(f) = \frac{s}{s^2 + 4}, \] for \( |s| < a \). Hence evaluate
\[ \int_{0}^{\infty} \left( \sin t - t \cos t \right) \frac{e^{-at}}{t} \, dt. \]

4. Integrate \( \int_{0}^{\infty} \frac{x + ax}{x + b} \) using transform method.

5. Organize the Fourier sine and cosine transform of
\[ f(x) = \begin{cases} x, & 0 < x < 1 \\ -x, & -1 < x < 0 \end{cases} \text{ and } y(x, t) = 0, x > 2 \]

6. Prove that the Laplace Transform of the triangular wave of period 2\( \pi \) defined by
\[ f(t) = \begin{cases} \frac{t}{t}, & 0 \leq t \leq \pi \\ \frac{\pi}{2} \left( 1 + \cos \frac{\pi}{2} \right), & \pi < t < 2\pi \end{cases} \]

7. Organize the inverse Laplace transform of
\[ \frac{s^2 + 4s + 13}{s(s+2)^2} \] using partial fraction.

8. Solve using Laplace Transforms
\[ \frac{d^2y}{dx^2} + 4 \frac{dy}{dx} = 0. \]

9. Find
\[ \int_{0}^{\infty} \left( z^2 + 4 \right) dz \] by the method of partial fraction.

10. Using \( Z \)-Transform solve
\[ y(n) + 3y(n-1) - 4y(n-2) = 0, n \geq 2 \text{ given that } y(0) = 3 \text{ and } y(1) = 1. \]

**Evaluate**

1. Determine the Fourier series of the function \( f(x) \) of Period \( 2\pi \) given by
\[ f(x) = \begin{cases} \frac{2x}{\pi}, & -\pi < x < 0 \\ \frac{2x}{\pi}, & 0 < x < \pi \end{cases} \]

2. A string is stretched between two fixed points at a distance \( 2 \) apart and the points of the string are given initial velocities ‘u’ where
\[ u = \begin{cases} \frac{c}{x}, & 0 < x < x \text{ being the distance from one end point. Find the displacement of the string at any subsequent time.} \\ \in, & (2-x) \quad \text{in } \quad x < 2 \end{cases} \]
3. Use transforms method to evaluate \( \int_0^{\infty} \frac{dx}{(x^2 + 1)(x^2 + 4)} \).

4. Determine the Fourier cosine transform of \( e^{-\alpha x^2} \). Hence prove \( e^{-\frac{1}{2} x^2} \) is a self-reciprocal.

5. Choose the Laplace transform of the function \( f(t) \) with period \( \frac{2\pi}{\omega} \), where

\[
 f(t) = \begin{cases} 
 \sin \omega t, & \text{for } 0 < t < \frac{\pi}{\omega} \\
 0, & \text{for } \frac{\pi}{\omega} < t < \frac{2\pi}{\omega} 
\end{cases}
\]

6. Using Laplace transform evaluate \( \int_0^{\infty} te^{-3t} \sin 2t \, dt \)

7. Using Convolution theorem find the inverse Laplace transform of \( \frac{s}{(s^2 + 25)} \).

8. Solve using Laplace transforms \( \frac{d^2 y}{dt^2} + 4 \frac{dy}{dt} + 4y = te^{-t} ; y(0) = 0; y'(0) = -1 \).

9. Solve the equation \( n^2 y_{n+2} + 7y_{n+1} + 12y_n = 2^n \), given that \( y_{-1} = y_0 = 0 \).

10. Evaluate inverse Z-transform of \( \frac{z}{(z-1)(z-2)(z-3)} \) by the method of partial fraction.

---

**15IT302 DIGITAL SYSTEM DESIGN**

**Course Objectives**

Understand the most common digital logic families

Design combinational and sequential circuits using logic gates

---

**Course Outcomes (COs)**

Understand the concept of digital and binary systems

Analyze and design combinational logic circuits based on functional specification

Analyze and design sequential logic circuits for the given specification

---

**UNIT I**

**FUNDAMENTALS**

Number system and conversions - Boolean algebra and Simplification - Minimization of Boolean functions - Sum of Products and Product of Sums - Karnaugh map - Quine McCluskey Method - Prime Implicants and Essential Prime Implicants.

---

**UNIT II**

**COMBINATIONAL CIRCUITS**


---

**UNIT III**

**SYNCHRONOUS SEQUENTIAL CIRCUITS**

UNIT IV
ASYNCHRONOUS SEQUENTIAL CIRCUITS
Design Procedure for Asynchronous Sequential Circuits - Reduction of State and Flow Tables - Race free State Assignment - Hazards: Static and Dynamic Hazards.

UNIT V
MEMORY AND PROGRAMMABLE LOGIC
Introduction - RAM and ROM - Memory decoding - Error detection and correction - Programmable Logic Array(PLA) - Programmable Array Logic(PAL) - Sequential programmable devices - Application specific integrated circuits.

FOR FURTHER READING
Study on digital logic integrated circuits.

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Assessment Pattern</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit/RBT</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 4 1 4</td>
<td>1 4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>2 2 2 4</td>
<td>2 4</td>
<td>2 4</td>
<td>4</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2 2 4 2</td>
<td>2 4</td>
<td>2 4</td>
<td>5</td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>4 2 2 4</td>
<td>2 4</td>
<td>3 2</td>
<td>4</td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>2 2 2 4</td>
<td>2 4</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
- Define byte.
- Which gate is equal to AND-inverter Gate?
- What is latch? What is the difference between latch and flip flop?
- Define prime implicants and Essential prime implicants.
- What is the use of Don’t care conditions?
- List the characteristics of digital ICs.
- Why parity checker is needed?
- Draw the logic diagram of a 2 bit multiplier.
- What is the decimal value for 10010?
- What is code converter?

Understand
- How will you build a full adder using 2 half adders and an OR gate?
- What is the number with an exponent of 1 is equal to?
- Draw the logical diagram for the function without simplifying 
  \((A+B)(C+D)(A'+B+D)\)
- Realize \(F(w, x, y, z) = \Sigma (1,4,6,7,8,9,10,11,15)\) using 8 to 1 Mux.
- Prove \(AB+AB'C+BC'=AC+BC'\)
- What are the four design procedures in combinational circuit?
- Obtain the 1’s and 2’s complement for the binary number: 00010000.
- Simplify the following Boolean expression to a minimum number of literals \(xy+xy'\)
Draw a NAND logic diagram that implements the complement of the following function:
\[ F(A,B,C,D) = \Sigma(0, 1, 2, 3, 6, 10, 11, 14) \]
Using Quine McCluskey method Simplify the Boolean expression
\[ F(v, w, x, y, z) = \Sigma(4, 5, 9, 11, 12, 14, 15, 27, 30) + \Sigma o(1, 17, 25, 26, 31) \]

**Apply**

Show the binary to gray conversion for 110010.
Determine the minimum sum of products and minimum product of sums for
\[ f = b'c'd + bc + a'cd + bc'd \]
Design a mod-7 counter using JK flip-flops.
Design a sequential circuit with four flip-flops ABCD. The next states B, C and D are equal to the present states of A, B, C respectively. The next state of A is equal to the EX-OR of present states of C and D.
Implement the following Boolean expression with exclusive-OR and AND gates:
\[ F = b'C'D + A'BC'D + A'B'C'D \]
Simplify the given Boolean function \( F(A, B, C, D) = \Sigma m(0, 1, 2, 8, 10, 11, 14, 15) \) using Quine McClusky algorithm.
Simplify the following Boolean expressions using four-variable maps:
\[ F(w, x, y, z) = \Sigma(1, 4, 5, 6, 12, 14, 15) \]
Realise the functions \( f_1(x, y, z) = \Sigma m(1, 2, 4, 5) \) and \( f_2(x, y, z) = \Sigma m(1, 5, 7) \) using MUX.
Prove \( x + 1 = 1 \)
Using 10’s complement, subtract 72532 from 3250.

**Analyse**

Explain why unused states generate don’t-care terms when translating a state table to a transition table? Illustrate your response with a sample state table.
Explain why J - K flip-flops produce more don’t-care terms than the other flip-flop types, even when all of the states are specified.
Compare binary and gray code.
Differentiate between combinational and sequential logic.
Differentiate between PLA and PAL.
Define the need of characteristics table. Justify with JK flip-flop.
How does the Moore type vary from Mealy type sequence detector?

**Evaluate**

Design a synchronous circuit that has a single input variable and single output variable. The input data are received serially. The output Z is to change only when three consecutive input bits have the same value. Decide whether a Moore or a Mealy performs better.
Design a serial bit pattern detector that will detect the input sequence 01010 in a longer bit string. If the pattern is detected, then cause output Q to be active high. If a 011 bit pattern occurs within the same serial data string, cause output P to be active high. If the 011 pattern occurs, cause the state machine to initialize and start over looking for the 01010 pattern. Overlapping sequences can occur. Compare the performance of the circuit for a Moore and Mealy configurations.
Consider the signed binary numbers: \( A=0100110 \) and \( B=01010011 \).
Perform the operations \( (A-B) \) and \( (-A+B) \).

**Create**

Design a Mealy sequential machine that will detect the following input sequences \( x = 01101 \) or \( 01111 \). If input sequence \( x=01101 \) is met, cause \( z_1 = 1 \). If \( x = 01111 \), cause \( z_2 = 1 \). Each input sequence may overlap with itself or other sequence. Document the whole procedure.
Design a special hardware comparator that would keep track of the maximum and minimum of a series of numbers. The numbers are presented to the hardware one at a time beginning with the count of numbers followed by the numbers themselves.

**15IT303 COMPUTER ARCHITECTURE  3 0 0 3**

**Course Objectives**

Understand the basic structure and operation of a digital computer

Familiarize with the implementation of fixed point and floating-point arithmetic operations

Explore the processing of instruction and control unit design

Acquire the knowledge of Parallel processing and memory hierarchy system

**Course Outcomes (COs)**

- Apply the knowledge of performance metrics to find the performance of systems
- Determine the technique to execute multiple instruction in single core and multicore processor
- Analyze how parallel processing and memory system can have significant impact on performance of a digital computer
- Identify the different types of parallelism that can be exploited in a computer architecture

**UNIT I**

**COMPUTER STRUCTURE**

9 Hours

Evolution of Computers - Functional units and its operational concepts - Performance - Memory operations, locations and addresses - Instruction and instruction sequencing - Addressing modes - Assembly language.

**UNIT II**

**ARITHMETIC OPERATIONS**

10 Hours

Fixed Point Arithmetic - Addition and subtraction of signed numbers - Design of fast adders - Multiplication of positive numbers - Signed operand multiplication and fast multiplication - Integer division - Floating point numbers and operations.

**UNIT III**

**BASIC PROCESSING AND CONTROL UNIT**

10 Hours

Basic MIPS implementation - Data path and control consideration - Execution of a complete instruction - Hardwired Control - Microprogrammed Control - Pipelining and its Hazards.

**UNIT IV**

**PARALLELISM**

8 Hours

Instruction level parallelism - Parallel processing challenges - Flynn's classification - Hardware multithreading:SISD, MIMD, SIMD, SPMD and Vector multithreading- Multicore processors:Shared memory multiprocessor and cluster multiprocessor.

**UNIT V**

**MEMORY AND I/O SYSTEMS**

8 Hours
Memory hierarchy: Cache memory and Virtual memory - Accessing I/O devices - DMA and interrupts.
FOR FURTHER READING
Communication methods: Buses and Interface - RISC and CISC processors - Stack Processor-Superscalar and vector processor.  

Total: 45 Hours

Reference(s)


Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total 100

Assessment Questions

Remember

- List the two ways to improve the performance of a computer
- How are Program Partitioning and Scheduling Lines defined?
- Distinguish between static RAM and dynamic RAM.
- What is the transformation $011\ldots110 \Rightarrow 100\ldots0-10$ is called as?
- What is clock rate?
- List various addressing modes.
- State booth’s algorithm.
- List out the types of busses.
- List out the merits of RISC processor.
- Define cycle stealing in DMA.
- Recall the requirements for memory management.

Understand

- Differentiate between deadlock and livelock.
- Examine how Organization of the control unit allows the conditional branching in the microprogram control.
- Describe the Flynn's classification of parallel architectures.
- Distinguish between write-through and write-back caches.
- Explain the SIMD hardware multi-threading.
- How would you measure the performance of the computer?
- Illustrate the virtual memory technique.
- Identify the influence of instruction sets with different modes.
- Illustrate the use of cache memory and enumerate any two types of mapping methods.
- Infer how interrupt request generate between I/O device and processor using interrupt priority schemes.
Explain how sequentially a complete instruction is executed by the processor.

Apply

Suppose a block needs to be written back while there are invalidations pending for it. Can this lead to problems, or is it safe? If it is problematic, how might you address the problem? Are eager exclusive replies useful with an underlying SC model? Are they at all useful if the processor itself provides out of order completion of memory operations, unlike the MIPS R10000?

Could you have a hierarchical bus based system with centralized memory (say) without pursuing the inclusion property between the L2 (node) cache and the L1 caches? If so, what complications would it cause?

Delaying the propagation of invalidations until a release point or even until the next acquire point (as in lazy release consistency) can be done in hardware-coherent systems as well. Why is LRC not used in hardware-coherent systems? Would delaying invalidations until a release be advantageous?

Subtract (1010)2 from (1101)2 using 1s complement.

Execute the expression \((A*(B/C)) + (D - E)\) in various instruction formats with its transfer notations in registers.

Show how the instruction is processed between memory and the processor.

Consider the following instructions to be executed in a pipelining.

- **Mul** R2, R3, R4
- **Add** R5, R4, R6

Originates the possible position where stall occurred.

Execute an addition with two numbers (11010 and 11100) using full adder circuit and display an array of carry values.

Execute the signed-operand multiplication of \((-6)\times(+15)\) using Booth’s algorithm

Convert the following pairs of decimal number to 5-Bit, signed, 2’s complement, and binary number and add them. State whether overflow occurs in each case:

- 5 and 10
- 7 and 13
- -14 and 11
- -5 and 7
- -3 and -8
- -10 and -13

A computer uses a small direct mapped cache between the main memory and the processor. The cache has four 16-bit words, and each word has an associated 13-bit tag, as shown in fig . When a miss occurs during a read operation the requested word is read from the main memory and sends to the processor. At the same time, it is copied into the cache, and its block number is stored in the associated tag. Consider the following loop in a program where all instruction and operands are 16-bits long:

- **LOOP Add (R1)+,R0**
- **Decrement R2**
- **BNE LOOP**

(A) Cache (B) Main Memory

FIGURE (a) cache and (b) main memory contents

Assume that, before this loop is entered, registers R0, R1 and R2 contain 0,054E and 3, respectively. Also assume that the main memory contain the data shown in the fig above, where all entries are given in hexadecimal notation. The loop starts at the location LOOP=02EC.

Assume that, before this loop is entered, registers R0, R1 and R2 contain 0,054E and 3, respectively. Also assume that the main memory contain the data shown in the fig above, where all entries are given in hexadecimal notation. The loop starts at the location LOOP=02EC.

Show the contents of the cache at the end of each pass through the loop
(b) Assume that the access time of the main memory is 10τ and that of the cache is 1τ.
Calculate the execution time for each pass. Ignore the time taken by the processor between memory cycles.
In many computers the cache block size is in the range of 32 to 128 bytes. What would be the main advantages and disadvantages of making the size of cache blocks larger or smaller?

Analyse
Evaluate the expression, A*B+C*D and write a program in a single-accumulator processor.
Assume that the processor has load, store, multiply and add instructions, and that all values fit in the accumulator.
When a stream of instructions to the execution is interrupted the branch instructions execution will stall. How you will solve this problem in the following cases.
Unconditional branches.
Conditional branches
How can we speed up the multiplication process?
How enough concurrency is identified in parallelism?
Why it is necessary to flush TLBs when doing migration or replication of pages?
One alternative to prefetching is to use non blocking load operations, and issue these operations significantly before the data are needed for computation. What are the tradeoffs between prefetching and using nonblocking loads in this way?

Evaluate
A computer uses a small direct mapped cache between the main memory and the processor. The cache has four 16-bit words, and each word has an associated 13-bit tag. When a miss occurs during a read operation the requested word is read from the main memory and sends to the processor. At the same time, it is copied into the cache, and its block number is stored in the associated tag. Consider the following loop in a program where all instruction and operands are 16-bits long:
LOOP: Add (R1)+, R0
Decrement R2
BNE LOOP
(A) Cache (B) Main Memory
FIGURE (a) cache and (b) main memory contents
Assume that, before this loop is entered, registers R0, R1 and R2 contain 0, 054E and 3, respectively. Also assume that the main memory contain the data shown in the fig above, where all entries are given in hexadecimal notation. The loop starts at the location LOOP=02EC.
Show the contents of the cache at the end of each pass through the loop.
Assume that the access time of the main memory is 10τ and that of the cache is 1τ.
Calculate the execution time for each pass. Ignore the time taken by the processor between memory cycles.
An address space is specified by 24 bits and the corresponding memory space by 16 bits:
How many words are there in the virtual memory and in the main memory?
Execute the non-restoring division of (8)/ (3).
Perform multiplication of 12, 8 using sequential circuit binary multiplier and also elaborate its register configuration with a neat diagram.
Does the number of processor is limited by bus organization?

Create
Investigate why RISC is universally accepted for all systems.
A pipeline processor uses the delayed branch technique. You are asked to recommend one of two possibilities for the design of this processor. In the first possibility, the processor has four stage pipeline and one delay slot, and in the second possibility, it has 6 stage pipeline with two delay slot. Compare the performance of these two alternatives, taking only the branch penalty into account. Assume that twenty percent of the instructions are branch instructions.
and that an optimizing compiler has 80 percent success rate in filling the single delay slot. For the second alternative, the compiler is able to fill the second slot 25 percent of the time.

15IT304 SOFTWARE ENGINEERING

Course Objectives
Understand the various process models available for software development
Analyze, synthesize and design software systems for any given specification

Course Outcomes (COs)
Understand software development life cycle and prepare SRS document for a project
Apply appropriate software design and development techniques for a given application
Implement testing methods at each phase of SDLC
Analyze and Apply project management techniques for a given application

UNIT I
SOFTWARE PROCESS MODELS

UNIT II
REQUIREMENTS ANALYSIS AND SPECIFICATION

UNIT III
SOFTWARE DESIGN
Design Concepts - Modular design - Design heuristic - Design model and document - Architectural design - Software architecture - Data design - Transform and transaction mapping - User interface design - Real Time Systems: Real time software design - System design - Real time executives.

UNIT IV
SOFTWARE TESTING TECHNIQUES
Software testing fundamentals - Internal and external views of Testing - White box testing - Basis path testing - Control structure testing - Black box testing - Regression Testing - Unit Testing - Integration Testing - Validation Testing - System Testing and Debugging.

UNIT V
SOFTWARE PROJECT MANAGEMENT
Software Cost Estimation - Function Point Models - COCOMO Model - Delphi Method - Scheduling

FOR FURTHER READING
Software Quality assurance - Review techniques: informal and formal review techniques.

Total: 45 Hours
Reference(s)


Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 2 2 2</td>
<td>1 2</td>
<td>4 2</td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>1 3 2 2</td>
<td>2 2 2</td>
<td>2 2</td>
<td>4</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>4 2 4</td>
<td>4</td>
<td>2 4</td>
<td>2</td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2 2 2</td>
<td>4</td>
<td>1 4</td>
<td>2 4</td>
<td>4</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>1 1 2 4</td>
<td>4</td>
<td>2 4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

Define software Engineering
List the various software life cycle models.
Differentiate verification and validation.
Why does waterfall model sometimes fail?
Why is it difficult to gain a clear understanding of what the customer wants?
Label the internal and external views on testing.
Who are the stakeholders in a software project management?
Give any two software measures.
State the formula for estimating the effort time.
What are the measurable attributes of software quality program?

Understand

State the difference between customers and end users.
Explain the features of prototyping model and outline its merits and demerits.
Compare the various software development models.
Illustrate the software project management principles.
Interpret the difference between cohesion and coupling.
Classify the information produced as a consequence of requirement gathering.
Infer the user interface design steps in software design process.
Express the term COCOMO cost estimation model with its equation.
Summarize the various stages involved in SCM process.
Explain RMMM plan.
Illustrate the control structure testing with its types.

Apply

Demonstrate the features of equivalence class partitioning with an example.
Show how to perform transform and transaction mapping.
Assess the importance of boundary value analysis and its similarity with equivalence partitioning.
How conventional software engineering differs from agile engineering?
Write about the general principles of capability maturity model.
Explain the goals of data gathering process.
Why integration testing is harder than unit testing?
What are all the formulas available for calculating Cyclomatic complexity and Calculate cyclomatic complexity for greatest of three numbers.
Discover 4 increments that can be incorporated into word processing software by an incremental process model.
Compare Spiral and Win Win spiral model.

Analyse
Analyze the concept of CCPDS-R life cycle overview.
Categorize the various stages of COCOMO model.
Outline the various configuration Management functions and explain why CM is given very high priority in the industry.
Parse the knowledge required to develop an effective use case and justify.
Explain how Software Quality assurance Process differ from software development process and also explain each phases of software quality program development.
Outline the contents of test plan.
Explain the framework of the quality assurance organization structures with neat diagram.

Evaluate
Determine the most effective software life cycle model for fastest application development.
Criticise on adapting reverse engineering.
Check whether testing of OO system is different from function oriented testing.
Determine the characteristics of software quality programs.
Categorize the software quality metrics.

Create
Develop a high level use case diagram for the given scenario:
- Searching for books using an on-line bookstore
- Buying a stock using an on-line brokerage account
Dramatize the concept of Inspection Data Analysis.

15IT305 DATA STRUCTURES AND ALGORITHMS

Course Objectives
Study the recursion fundamentals, asymptotic notations and master the implementation of linked data structures such as linked lists and trees
Familiarize with Hashing Techniques, Disjoint set ADTs and Graph algorithms

Course Outcomes (COs)
Apply asymptotic notations for time and space complexity analysis and implement sorting and searching algorithms
Implement Linear and Non Linear Data Structures with the help of array and linked representation
Implement Hashing techniques, Disjoint set ADT and Graph Algorithms

UNIT I
INTRODUCTION

UNIT II
LINEAR DATA STRUCTURES
List ADT - Stack ADT - Queue ADT - Array and Linked Implementations - Applications.
UNIT III  
NON LINEAR DATA STRUCTURES  

UNIT IV  
PRIORITY QUEUE AND HASHING  
Priority Queue - Binary Heap - Heapsort - Hash functions - separate chaining, open addressing - rehashing - Extendible hashing.

UNIT V  
DISJOINT SET ADT AND GRAPH ALGORITHMS  
Basic data structure - smart union algorithms - path compression - Topological sort - Shortest path algorithms - Minimum spanning tree.

FOR FURTHER READING  

Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>2 5</td>
<td>15 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>2 5</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>4 10</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>5</td>
<td>3 10 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
How do you represent a binary tree in the form of an array?
Define push and pop operations of stack ADT.
State the time complexity of insertion sort, merge sort and quick sort algorithms.
What is big O notation?
What is an ADT?
Define stack.
List the areas in which data structures are applied extensively.
What is a linear data structure?
What is a non-linear data structure?
What is a data structure?
Understand

Differentiate between big Oh, big Omega and Big theta.
State the advantages of using postfix notation when compared to infix notation.
Inappropriate use of recursion will result in infinite execution. Justify with an example recursion code.
Why recursive algorithms are efficient than non-recursive algorithms?
What is the minimum number of queues needed to implement the priority queue?
Describe a situation where storing items in an array is clearly better than storing items on a linked list.
Write a class definition that could be used to define a node in a doubly linked list. Include only the instance variables, not the methods. Also write one sentence to describe a situation when a doubly linked list is appropriate.
How many different trees are possible with 10 nodes?
What is the suitable data structure for constructing a tree?
Classify the Hashing Functions based on the methods by which the key value is found.

Apply

1. Design an algorithm to sort a given set of elements using priority queue.
2. Write a pseudo code to compute the power of a given number using recursion.
3. Insert the following elements into an empty binary search tree and then perform left rotation with respect the root: 3,7,4,8,2,9,0,11. Show the resultant tree.
4. Insert the following elements into an empty hash table of size 13. Use separate chaining for collision resolution. 364, 564, 383, 679, 457, 586, 232, 563, 193
5. Find the shortest path from A to all other vertices for the following graph:(A,B,5), (A,C,3), (B,C,2), (B,E,3), (B,G,1), (C,D,7), (C,E,7), (D,A,2), (D,F,6), (E,F,7), (E,D,2), (G,E,1). Read the graph as (start vertex, end vertex, distance)
6. Design an algorithm to carry out deletion operation in binary search tree.
7. The preorder traversal sequence of a binary search tree is 30, 20, 10, 15, 25, 23, 39, 35, 42. Find the postorder traversal sequence of the same tree?
8. Given a list of elements 12, 45, 56, 89, 78, 125, 3, 47, 555, 999, 99, 21 trace the steps to sort them using bubble sort algorithm.
9. Define an AVL tree. Obtain an AVL tree by inserting one integer at a time in the following sequence. 150, 155, 160, 115, 110, 140, 120, 145, 130, 147, 170, 180. Show all the steps.
10. Demonstrate Dijkstra’s algorithm to find the shortest distance in a weighted graph.

Analyse

Write a function that takes the root node pointer of a singly linked list as input and returns the middle node pointer. Inside the function, the linked list should be traversed only once. If the hash table size is not prime, it is possible to run out of alternative locations prematurely. Illustrate with the help of an example.
Distinguish DFS and BFS.
Compare linear and binary search
Contrast ADT implementation of array and linked list
Compare internal and external sorting

Evaluate

Evaluate the best case and worst case complexity for searching algorithms.
Can stack be used to perform queue operations? Justify.
Explain the Basic operations performed in a Binary heap. Construct a Min and MAX heap for the following values.23,67,1,45,7,89,56,35
Summarize the concept of Huffman algorithm for constructing an optimal prefix code.
Apply the algorithm and find the code for the following data: (a, 300), (b, 384), (c, 77), (d, 34), (e, 23). A Read the input as (character, frequency).
Create
Develop an algorithm for Minimax tic-tac-toe algorithm with alpha-beta pruning using backtracking strategy.
Develop an application using a stack /Queue /List /Tree that reflects a real world problem.

15IT306 JAVA PROGRAMMING 3 0 2 4

Course Objectives
Design, write, debug and run java programs using JDK tools
Develop applications to manipulate the data available in databases using database connectivity and Java library
Develop Event driven programs using Multithreading and Event handling mechanisms

Course Outcomes (COs)
Write application programs using Object Oriented principles
Develop event-driven GUI applications using Event handling mechanisms and the Java standard class library
Apply the multithreaded programming concept to develop applications in multi core environment

UNIT I 11 Hours
BASICS OF JAVA
Overview of Java - Data Types, Variables, and Operators - Control Structures - Arrays - Classes - Objects Methods - Nested Classes - Primitive type Wrappers - Inheritance - Method overriding - Abstract Classes - Interfaces - Packages and Exception Handling.

UNIT II 7 Hours
GENERIC PROGRAMMING AND I/O STREAMS
Generics Types - Generic Classes and Methods - Wild Cards and Type Erasure - Restrictions on Generics - Collection classes: Array List, HashMap, HashTable, Linked List, Vector, Garbage Collection - I/O Classes and Interfaces - File - The Byte Streams - The Character Streams - Using Stream I/O - Serialization.

UNIT III 8 Hours
JAVA LIBRARY

UNIT IV 10 Hours
EVENT HANDLING

UNIT V 9 Hours
CONCURRENT PROGRAMMING
FOR FURTHER READING
Note pad application- Standalone applications using java - Implementing algorithms using java - Reflection

EXPERIMENT 1
Programs using class and methods
4 Hours

EXPERIMENT 2
Inheritance implementation
3 Hours

EXPERIMENT 3
Inheritance via Interface and Abstract class
3 Hours

EXPERIMENT 4
Programs on Package implementations
4 Hours

EXPERIMENT 5
Applications using Generic collections
4 Hours

EXPERIMENT 6
File Handling using IO streams
4 Hours

EXPERIMENT 7
Desktop applications using Swing
4 Hours

EXPERIMENT 8
Multi-threaded Programming
4 Hours

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>12</td>
<td></td>
<td>6</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>2</td>
<td>12</td>
<td></td>
<td>6</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Total 100
Assessment Questions

Remember
List the eight primitive datatypes supported by java.
What is the return type of a method that does not return any value?
Define the term serialization in java.
Define Enumerations.
List the types of drivers available for connecting database with java.
List the methods declared under KeyListener interface in java event handling.
List the four types of layouts supported in AWT.
List the methods associated with Thread class.
Depict the diagram of complete life cycle of a thread.
Which is a standard collection class that implements a dynamic array?

Understand
Classify the types of control structures based on the flow of execution
Compare method overloading and method overriding concepts in java.
Summarize the collection classes available in java.
Explain the concept of erasure in generics.
Identify the two ways of registering a driver in JDBC.
Illustrate the types of constructors used by the String Class using an example program.
Identify the difference between paint and repaint methods in applets.
Explain the event handling mechanism in java.
Classify the two ways of creating thread in java.
Compare process based system with thread based system.

Apply
redirect the output for the following code segment, public class Test {
    public static void main(String[] args) {
        int j = 5;
        for (int i = 0; i < j; i++) {
            if (i < j--)
                System.out.print((i * j) + " ");
        }
    }
}

Demonstrate the use of for each statement for the following array.
String[] name = {"Ram","Sundar","Nisha","Veena","Kamal"};

use PushbackReader class to show how a programming language parser can use a pushback stream to deal with the difference between the == operator for comparison and the = operator for assignment.

Design a simple generic version of method isEqualTo that compares its two arguments with the equals method and returns true if they’re equal and false otherwise. Use this generic method in a program that calls isEqualTo with a variety of built-in types, such as Object or Integer.

Apply the String method regionMatches to compare two strings input by the user. The program should input the number of characters to be compared and the starting index of the
comparison. The program should state whether the first string is less than, equal to or greater than the second string. Ignore the case of the characters when performing the comparison.

Implement a very simple client and server network communication using Datagram to send a message from server to Client.
Design an applet that uses showstatus() to display the name of the current month, day, and year.
Implement the mouseclicked and mouseentered methods available in Mouselistener interface in a class called MouseDemo. Test the class using user input.
Develop an application that executes two threads. One thread displays "Welcome" every 1000 milliseconds, and the other displays "BIT" every 2000 milliseconds. Create the threads by extending the Thread Class.
Write a multithreaded that simulates a set of grasshoppers jumping around in a box. Each grasshopper jumps to a different location every 2 to 10 seconds. Display the new location of grasshopper after each of these jumps.

Analyse
Interface provides 100% pure abstraction compared with Abstract class. Justify the answer with Example
How do you determine type of Object Generics variable is using at run-time”?
If Serialization is not used, is it possible to persist or transfer an object using any other approach?
Compare the pros and cons of String, StringBuffer and StringBuilder classes in java.
Is it possible to create option button using AWT controls? Explain.
What happens if an exception is generated in a synchronized method or statement block? Explain.
Is it possible to execute methods simultaneously in java? Resolve the solution.

Evaluate
Compare the java programming language with C++.
String is immutable in java. Justify the answer.
An event-listener interface defines the methods that must be implemented by an event handler for a particular kind of event. But most of application's require only few methods. How can we overcome this drawback?

Create
Generate a java code to simulate the operation of a calculator.
Create an applet program that calculates the age of the person in terms of year, month and days.

Course Objectives
Design, analyze and test simple combinational logic using basic gates
Analyze and design basic sequential logic circuits for various applications

Course Outcomes (COs)
understand the concept of digital and binary systems
analyse, design, build and debug complex combinational based on functional specification
analyse, design, build and debug complex and sequential circuit for the given specification

EXPERIMENT 1
Design and Implementation of Code Converter

EXPERIMENT 2
Design of 4-bit Adder and Subtractor

EXPERIMENT 3
Design and Implementation of Multiplexer and Demultiplexer
EXPERIMENT 4
Design and Implementation of Encoder and Decoder

4 Hours

EXPERIMENT 5
Construction and Verification of Ripple Counter

4 Hours

EXPERIMENT 6
Design and Implementation of Synchronous UP/Down Counter

4 Hours

EXPERIMENT 7
Design and Implementation of Shift Register

4 Hours

EXPERIMENT 8
Implementation of simple combinational circuit using HDL

4 Hours

EXPERIMENT 9
Implementation of simple sequential circuit using HDL

Total: 30 Hours

15IT308 DATA STRUCTURES AND ALGORITHMS LABORATORY

Course Objectives
Familiarize students in the implementation of searching algorithms, sorting algorithms, linear & non linear data structures.

Course Outcomes (COs)
Implement searching algorithms and sorting algorithms
Implement Linear data structures (list, stack & queue) and non linear data structures (trees and graphs).

EXPERIMENT 1
Implementation of Searching Algorithms

4 Hours

EXPERIMENT 2
Implementation of sorting algorithms

6 Hours

EXPERIMENT 3
Implementation of LIST ADT using Array and Linked Representation

4 Hours

EXPERIMENT 4
Implementation of Stack ADT using Arrays and Linked list

4 Hours

EXPERIMENT 5
Implementation of Queue ADT

4 Hours

EXPERIMENT 6
Implementation of Trees
EXPERIMENT 7
Implementation of Graph Algorithms

Total: 30 Hours

15IT309 MINI PROJECT I 0 0 2 1

Course Objectives
To develop knowledge to formulate a real world problem and project's goals.
To identify the various tasks of the project to determine standard procedures.
To identify and learn new tools, algorithms and techniques.
To understand the various procedures for validation of the product and analysis the cost effectiveness.
To understand the guideline to Prepare report for oral demonstrations.

Course Outcomes (COs)
Formulate a real world problem, identify the requirement and develop the design solutions.
Express the technical ideas, strategies and methodologies.
Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
Prepare report and present the oral demonstrations.

15GE310 LIFE SKILLS: BUSINESS ENGLISH 0 0 2 - 15

Course Objectives
To acquire command in both the receptive skills (Listening, Reading) and the productive skills (Writing and Speaking) of English language
To understand and make effective use of English language in business contexts

Course Outcomes (COs)
Listen, Read, Speak, and Write Business English to the level of becoming independent users
Appear for the Business English Certificate (BEC) Vantage level examination conducted by the Cambridge English Language Assessment

LISTENING AND READING (RECEPTIVE SKILLS)
Listening for writing short answers - filling gaps in sentences - identifying topic, context and function
identify different functions of language in business situations - identify prompts -identify paraphrases of required information - Scanning - reading for gist - understanding sentence structure - error identification - identify paraphrases - cohesive words and phrases - understand the importance of analysing the distractors - identify grammatical and semantic relationships
WRITING AND SPEAKING (PRODUCTIVE SKILLS)
Business Emails - notes - memos to colleagues or friends - Giving instructions - explaining a development - asking for comments - requesting information - agreeing to requests - explaining - apologising - reassuring - complaining - describing - summarising - recommending - persuading Turn-taking - sustaining interaction - initiating - responding - giving personal information - Talking about present circumstances, past experiences and future plans - expressing opinion - speculating - organising a larger unit of discourse - giving information - expressing and justifying opinions - speculating - comparing and contrasting - agreeing and disagreeing

Total: 30 Hours

Reference(s)

15MA404 DISCRETE MATHEMATICS

Course Objectives
Understand the notion of mathematical thinking, mathematical proofs and be able to apply them in problem solving.
Understand and use the terms Cardinality, finite, countably infinite and uncountably infinite, and determine which of these characteristics is associated with a given set.
Develop enough confidence to identify and model mathematical patterns in real world and offer appropriate solutions, using the skills learned in their interactive and supporting environment.

Course Outcomes (COs)
Formulate short proofs using the following methods: direct proof, indirect proof and proof by contradiction.
Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions and integers.
Apply the different properties of injection, surjection, bijection, composition and inverse functions.
Demonstrate the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.
Demonstrate abstract algebra, posets, lattices, Boolean algebra and their application in information Technology.

UNIT I 6 Hours
PROPOSITIONAL CALCULUS

UNIT II 5 Hours
PREDICATE CALCULUS
UNIT III
SET THEORY AND FUNCTIONS


UNIT IV
COMBINATORICS


UNIT V
LATTICES AND BOOLEAN ALGEBRA

Partial ordering—Posets—Lattices as Posets—Properties of lattices—Lattices as Algebraic systems—Sub lattices—Direct product and homomorphism—Some special lattices—Boolean algebra.

FOR FURTHER READING

Boolean expression from logic and switching network, Logic gate and switching circuit.

Total: 30 + 30 = 60 Hours

Reference(s)


Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

- Define a biconditional statement and draw its truth table
- State that \((P \land Q) \to (P \lor Q)\) is a tautology without constructing truth table
- Recall the expression “Some men are clever” in symbolic form
If A has 3 elements and B has 2 elements how many functions are there from A to B
Let A={1,2,3,4} and R={(x, y) / x > y}. Draw the graph of the relation
Define pigeonhole principle
List the two types of principle of counting.
Define recursive function.
Define a lattice.
In a Boolean Algebra, Recall that the complement of any element is unique

Understand
Identify the PCNF and PDNF of the formula given by \((\neg P \rightarrow R) \land (Q \rightarrow P)\)
Formulate this \(-Q, P \rightarrow Q, P \lor R \rightarrow R\) by indirect method
Show that \((A - B) \cup (B \cap C) = (A \cup B) \cap (B \cap C)\)
Let \(f(x) = x+2, g(x) = x-2, h(x) = 3x,\ for \ x \in R, \ where \ R \ is \ the \ set \ of \ real \ numbers.\)
Find \(f \circ g, f \circ f, g \circ g, f \circ g \circ h\) and also write the corresponding matrix.

Apply
Show that the premises “One student in this class knows how to write programs in JAVA” and “Everyone who knows how to write program in JAVA can get a high paying job” imply the conclusion “Someone in this class get a high paying job”
4. Show that the relation \(R= \{(1,2), (4,3), (2,2), (2,1), (3,1)\} \) on \(A= \{1,2,3,4\}\) is not transitive
5. Find the closed form expression of generating function for the sequence \(\{3^0, 3^1, 3^2, 3^3,\ldots\}\)
Find the number of different arrangements that can be made out of the letters of the word “TRIANGLE” if the vowels are to come together
Show that following implication \((P \rightarrow (Q \rightarrow R)) \Rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R))\)

Analyze/ Evaluate
1. Justify the following premises are inconsistent:
   If Rama gets his degree, he will go for a job. If he goes for a job, he will get married soon. If he goes for higher study, he will not get married. Rama gets his degree and goes for higher study
2. Conclude by mathematical induction that \(1^2 + 3^2 + 5^2 + \ldots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}\)
Determine that the direct product of two distributive lattice is a distributive lattice
In a Boolean lattice justify the De- Morgan’s law.
Judge the different bit strings are there of length seven.
Find the recurrence relation for a Fibonacci sequence
Let R denote a relation on the set of ordered pairs of integers such that \((x, y) \in R\) if \(x = y\).
Conclude that R is an equivalence relation.

8. Determine that \(S \lor R\) is tautologically implied by \((P \lor Q) \land (P \rightarrow R) \land (Q \rightarrow S)\) using
automatic theorem proving.

Justify that if n people attend a party and some shake hands with others (but not with
themselves), then at the end, there are at least two people who have shaken hands with the
same number of people.

10. Find the number of different arrangements that can be made out of the letters of the word
‘ACCOUNTANT’ if the vowels are to come together.

15IT402 DATABASE MANAGEMENT SYSTEMS

Course Objectives
- Understand functional components of the DBMS
- Understand need for concurrency and transaction property
- Compare and contrast various indexing strategies in different database systems

Course Outcomes (COs)
- Design a physical database using DDL statements with appropriate key, domain and
  referential integrity constraints
- Map ER model into Relational model and to normalize the relations
- Demonstrate the transaction process and concurrency execution of query
- Optimize the query using indexing and query optimization Techniques

UNIT I
INTRODUCTION TO DATABASE SYSTEMS
Evolution of Database and DBMS - Need for data management - Data models and Database
Architecture - Professions in DBMS - Key issues and challenges in Database Systems - Database
Applications.

UNIT II
DATA DEFINITION AND QUERYING
Data Definition Language (DDL) and Data Manipulation Language (DML) - Basic Operations - Set
Operations - Null Values - Modification of Database - Aggregate Functions - Nested Subqueries -
Transactions - Integrity Constraints - SQL Data Types and Schemas - Authorization - Joins - Views
– Triggers.

UNIT III
ER AND RELATIONAL MODELS
ER Diagrams - Relational Model - ER to Relational Mapping - Constraints - Keys - Dependencies -
Relational Algebra - Normalisation - First, Second, Third and Fourth Normal Forms - BCNF - Join
Dependencies.

UNIT IV
TRANSACTIONS AND CONCURRENCY
Introduction to Transactions - Transaction Systems - ACID Properties - System and Media
Recovery - Two Phase Commit Protocol - Recovery with SQL - Need for Concurrency - Locking
Protocols - Deadlocks and Managing Deadlocks - SQL Support for Concurrency.
UNIT V  
INDEXING AND DATABASE OPTIMIZATION
9 Hours
Indexing and Hashing Techniques - B-Tree - B+ Tree - Query Processing and Optimization - Sorting and Joins - Database tuning.

FOR FURTHER READING
Spatial and Temporal Databases - Mobile Databases - Multimedia and Web Databases.  
Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 2 12 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>2 2 12 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2 2 12 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2 2 12 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>2 2 12 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
List six major steps that you would take in setting up a database for a particular enterprise.
Give an example of an update that is neither speeded up nor slowed down by the indexes.
Relate DBMS and RDBMS.
Define the two principal integrity rules for the relational model.
Show that a query using the HAVING clause has an equivalent formulation without a HAVING clause.
Define the purpose and tasks associated with data administration and database administration.
State the transformation rules that apply to:
Selection operations
Projection operations
Theta join operations.
Relate ACID property of transaction with real world scenario.
Name the typical phases of query processing.
List the three design goals for relational databases, and explain why each is desirable.

Understand
Discuss insertion, deletion, and modification anomalies. Why are they considered bad?
Illustrate with examples.
Illustrate how the Database administrator and various users communicate to the database in the context of query processing and storage managing.
Explain the distinction between closed and open hashing. Discuss the relative merits of each technique in database applications.

Give an example of a serializable schedule with two transactions such that the order in which the transactions commit is different from the serialization order.

Consider a database for an airline where the database system uses snapshot isolation. Describe a particular scenario in which a nonserializable execution occurs, but the airline may be willing to accept it in order to gain better overall performance.

Since every conflict-serializable schedule is view serializable, why do we emphasize conflict serializability rather than view serializability?

If we assume that the DBA is never interested in running his or her own queries, does the DBA still need to understand query optimization? Justify your answer.

Describe the structure of a DBMS. If your operating system is upgraded to support some new functions on OS files (e.g., the ability to force some sequence of bytes to disk), which layer(s) of the DBMS would you have to rewrite to take advantage of these new functions?

If a query language is relationally complete, can you write any desired query in that language?

Consider a relation stored as a randomly ordered file for which the only index is an unclustered index on a field called sal. If you want to retrieve all records with sal > 20, is using the index always the best alternative? Explain.

Consider the universal relation \( R = \{ A, B, C, D, E, F, G, H, I, J \} \) and the set of functional dependencies \( F = \{ \{ A, B \}\rightarrow \{ C \}, \{ A \}\rightarrow \{ D, E \}, \{ B \}\rightarrow \{ F \}, \{ F \}\rightarrow \{ G, H \}, \{ D \}\rightarrow \{ I, J \} \} \). What is the key for \( R \)? Decompose \( R \) into 2NF and then 3NF relations.

Consider the following relation for published books:

\[ \text{BOOK} \ (\text{Book_title}, \text{Author_name}, \text{Book_type}, \text{List_price}, \text{Author_affil}, \text{Publisher}) \]

Author_affil refers to the affiliation of author. Suppose the following dependencies exist:

\[ \text{Book_title} \rightarrow \text{Publisher}, \text{Book_type} \rightarrow \text{List_price} \]

\[ \text{Author_name} \rightarrow \text{Author_affil} \]

What normal form is the relation in?

Apply normalization until you cannot decompose the relations further.

Supreme Products manufactures products like pressure cookers, cookwares, water purifiers, food processors etc. The company markets its products to wholesalers all over the country and dealers sell them to customer. The company has five regional offices and many sales persons are attached to regional offices. Salespersons contact dealers and explain about products, incentives offered, training programs for wholesalers and demo for customers etc. Dealers place orders with the salespersons attached with the regional office of their location. After receiving goods they make payments, which may be in installments. Company would like to develop a system to monitor sales of different products, performance of salespersons and orders from wholesalers.

Do the following:

(i) Identify entities, attribute and relationships giving functionalities and draw E-R diagram for the system.

(ii) Convert this to relational tables explaining logic involved.

Construct an E-R diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted.

Consider the following relational database

employee (employee name, street, city) works

(employee name, company name, salary)

company (company name, city)

manages (employee name, manager name)

Give an expression in SQL for each of the following queries.

a. Find the names of all employees who work for “First Bank Corporation”.

b. Find all employees in the database who live in the same cities as the companies for which they work.
c. Find all employees in the database who live in the same cities and on the same streets as do their managers.

Let relations $r1(A, B,C)$ and $r2(C, D, E)$ have the following properties: $r1$ has 20,000 tuples, $r2$ has 45,000 tuples, 25 tuples of $r1$ fit on one block, and 30 tuples of $r2$ fit on one block.

Estimate the number of block transfers and seeks required, using each of the following join strategies for $r1$ and $r2$:

1. Nested-loop join.
2. Block nested-loop join.
3. Merge join.
4. Hash join.

Consider the following two transactions: 
$T13$: read($A$); read($B$); if $A = 0$ then $B := B + 1$; write($B$).
$T14$: read($B$); read($A$); if $B = 0$ then $A := A + 1$; write($A$).

Let the consistency requirement be $A = 0$, $B = 0$, with $A = B = 0$ the initial values.

a. Show that every serial execution involving these two transactions preserves the consistency of the database.
b. Show a concurrent execution of $T13$ and $T14$ that produces a nonserializable schedule.
c. Is there a concurrent execution of $T13$ and $T14$ that produces a serializable schedule?

Consider the following tables: 
(Employee(Emp_no, Name, Emp_city))
(Company(Emp_no, Company_name, Salary))

Write a SQL query to display Employee name and company name.
Write a SQL query to display employee name, employee city, company name and salary of all the employees whose salary > 10000.

iii. Write a query to display all the employees working in 'XYZ' company.

For a simple BBS (Bulletin Board System) we use the following SQL statements to create two tables: one storing all posted messages and the other users who can post them.

CREATE TABLE Message ( mesgid INTEGER, poster INTEGER, subject CHAR(50), body CHAR(255), postdate DATETIME, PRIMARY KEY mesgid, FOREIGN KEY poster REFERENCES User (userid) ON DELETE CASCADE ON UPDATE CASCADE )
CREATE TABLE User ( userid CHAR(50), password CHAR(50), email CHAR(50), status CHAR(1), PRIMARY KEY(userid) )

(a) There is an error in one of the above statements. Point out the error, explain why it is wrong and correct the error by rewriting that SQL statement.
(b) Suppose there is a user with userid John in the database who has posted 100 messages. What will the DBMS do if we delete John from table User? What if we change John’s userid to Michael?
(c) Write an SQL statement to create a view of those messages with all their attributes that are posted by 'John'.
(d) Write an SQL statement to create a domain such that the status attribute can only take two values, i.e., ‘j’ and ‘s’.

Normalize the following schema, with given constraints, to 4NF:
books(accessionno, isbn, title, author, publisher)
users(userid, name, deptid, deptname)
accessionno→isbn
isbn→title
isbn→publisher
isbn→author
userid→name
userid → deptid
deptid → deptname

**Analyse**

Can data redundancy be completely eliminated in database approach? Why or why not?

Compare DDL, DML and DCL commands.

Suggest an efficient way to test if the bucket address table in extendable hashing can be reduced in size, by storing an extra count with the bucket address table. Give details of how the count should be maintained when buckets are split, coalesced, or deleted. (Note: Reducing the size of the bucket address table is an expensive operation, and subsequent inserts may cause the table to grow again. Therefore, it is best not to reduce the size as soon as it is possible to do so, but instead do it only if the number of index entries becomes small compared to the bucket-address-table size.)

Suppose that we are using extendable hashing on a file that contains records with the following search-key values:

2, 3, 5, 7, 11, 17, 19, 23, 29, 31

Show the extendable hash structure for this file if the hash function is h(x) = x mod 8 and buckets can hold three records.

Consider a disk with a sector size of 512 bytes, 2000 tracks per surface, 50 sectors per track, five double-sided platters, average seek time of 10 msec, and a block size of 1024 bytes is chosen. Suppose that a file containing 100,000 records of 100 bytes each is to be stored on such a disk and that no record is allowed to span two blocks.

How many records fit onto a block?

How many blocks are required to store the entire file? If the file is arranged sequentially on the disk, how many surfaces are needed?

**Evaluate**

Consider the following set F of functional dependencies on the relation schema

\((A, B, C, D, E, F)\)

\(A \rightarrow BCD\)

\(BC \rightarrow DE\)

\(B \rightarrow D\)

\(D \rightarrow A\)

Compute \(B+\).

Prove (using Armstrong’s axioms) that \(AF\) is a superkey.

Compute a canonical cover for the above set of functional dependencies.

Give each step of your derivation with an explanation.

Give a 3NF decomposition of \(r\) based on the canonical cover.

Prove that any relation schema with two attributes is in BCNF.

Consider the following relational database

employee (person name, street, city) works

(person name, company name, salary)

company (company name, city)

Give an expression in the relational algebra to express each of the following queries:

Find the names of all employees who live in city “Miami”.

Find the names of all employees whose salary is greater than $100,000.

Find the names of all employees who live in “Miami” and whose salary is greater than $100,000.

Prove that a functional dependency satisfies the formal definition of multivalued dependency.

Modify the data structures for multiple-mode locks and the algorithms for read_lock(X), write_lock(X), and unlock(X) so that upgrading and downgrading of locks are possible.

**Create**

A multinational engineering company has decided to distribute its project management information at the regional level in mainland Britain. The current centralized relational schema is as follows:
Employee (NIN, fName, lName, address, DOB, sex, salary, taxCode, deptNo)
Department (deptNo, deptName, managerNIN, businessAreaNo, regionNo)
Project (projNo, projName, contractPrice, projectManagerNIN, deptNo)
WorksOn (NIN, projNo, HoursWorked)
Business (businessAreaNo, businessAreaName)
Region (regionNo, regionName)

where Employee contains employee details and the national insurance number NIN is the key. Department contains department details and deptNo is the key. managerNIN identifies the employee who is the manager of the department. There is only one manager for each department.

Project contains details of the projects in the company and the key is projNo. The project manager is identified by the projectManagerNIN, and the department responsible for the project by deptNo.

WorksOn contains details of the Hours worked by employees on each project and (NIN, projNo) forms the key.

Business contains names of the business areas and the key is businessAreaNo.

Region contains names of the regions and the key is regionNo.

Departments are grouped regionally as follows:
Region 1: Scotland Region 2: Wales Region 3: England

Information is required by business area, which covers: Software Engineering, Mechanical Engineering, and Electrical Engineering. There is no Software Engineering in Wales and all Electrical Engineering departments are in England. Projects are staffed by local department offices.

As well as distributing the data regionally, there is an additional requirement to access the employee data either by personal information (by Personnel) or by work related information (by Payroll).

Build an Entity-Relationship (ER) diagram to represent this system.

Using the ER diagram, produce a relational database design for this system.

Construct a B+-tree for the following set of key values: (2, 3, 5, 7, 11, 17, 19, 23, 29, 31)
Assume that the tree is initially empty and values are added in ascending order.

Construct B+-trees for the cases where the number of pointers that will fit in one node is as follows:
- Four
- Six
- Eight

**Course Objectives**

Study about the object oriented system development life cycle

Learn various object oriented methodologies and Unified Modeling Language (UML)

Analyze and design the object oriented classes to develop quality software

**Course Outcomes (COs)**

Understand the importance of Unified Modeling Language (UML) and apply towards analysis and design of an application

Design various UML models using the appropriate notation for different applications

Design object oriented classes with attribute visibility using design axioms and protocols

Measure the level of user satisfaction with user interface design
UNIT I
INTRODUCTION
Object Basics - Object Oriented Systems Development Life Cycle - The software development process.

UNIT II
OBJECT ORIENTED METHODOLOGIES

UNIT III
OBJECT ORIENTED ANALYSIS
Identifying use cases - Object Analysis - Classification - Approaches for Identifying Classes - Identifying Object relationships.

UNIT IV
OBJECT ORIENTED DESIGN
Object Oriented Design Axioms - Designing Classes - Class visibility - Redefining attributes - Designing methods and protocols - Packages and managing classes - Access Layer.

UNIT V
SOFTWARE QUALITY AND USABILITY
Designing Interface Objects - User Interface Design as a creative process - Designing view layer classes - Macro level process - Micro level process - The Purpose of view layer interface - Prototyping the user interface - Software Quality Assurance - System Usability.

FOR FURTHER READING
Building high quality software - Frameworks - Measuring User Satisfaction.

EXPERIMENT 1
Program Analysis and Project Planning

EXPERIMENT 2
Software requirement Analysis

EXPERIMENT 3
Data modeling using Unified Modeling Language

EXPERIMENT 4
Software Development and Debugging

EXPERIMENT 5
Software Testing using various testing tools

Total: 60 Hours

Reference(s)
Mahesh P Matha, Object Oriented Analysis and Design Using UML, PHI, 2012
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>6 2</td>
<td>4 2</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>2 4</td>
<td>4 2</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>2 2</td>
<td>6 4</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2 6</td>
<td>2 4</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>2 4</td>
<td>2 6</td>
<td></td>
<td>4</td>
<td>4</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

Recognize the two orthogonal views of the software.
Define use cases.
State the 80-20 rule.
Interpret the four phases in OMT.
Enlist out the 4 steps for finding the attributes of a class.
Define pattern mining. Give the steps involved in capturing pattern.
Label the main activities in design process.
List the guidelines for developing quality assurance test cases.
Suppose you are a test manager, what are the milestones you would select for unit, integration test plans? what should be included in the milestone report for testing?
Elucidate the basic concepts of Unified Modeling Language.

Understand

Identify attributes and methods of a dishwasher object.
Comprehend the steps required to build high quality software.
Differentiate between the <extend> and <> relationship in the usecase diagram.
What are the various diagrams that are used in analysis and design steps of Booch Methodology?
How is recursion represented in a sequence diagram?
Explain the steps involved in Identifying Classes and their behaviors through Sequence modeling.
Discuss about the usability testing in detail and give the guidelines for developing it.
Elaborate the process of designing view layer classes.
Describe about 1-to-many relationships between classes.
What do you mean by aggregation? What are the major properties of a part-of relation?

Apply

Choose an area of commercial activity (business, industry, government agency, etc.) with which you are familiar. Identify some ways in which products show the use of generalization and some ways that components used as inputs. Show the use of generalization.
Show the incorporation of users needs into the system development process.
Sketch UML diagrams for Telephone Billing System.
A master student shall be modelled using a UML diagram. A student can be asleep or awake. A woken student can be at the TUHH, at home, i.e. in his room, in the kitchen and in the bathroom. Which diagram type would you use to describe this? Draw a diagram for this.
There are two different types of interaction diagrams: sequence and collaboration diagrams. Compare the two types of diagrams. What are the key differences between those diagram types considering their characteristics and their application?
Illustrate about the different models involved in designing access layer.
Identify the attributes and methods of a dishwasher object and explain the process flow with neat diagram.

With an example explain how use case modeling is used to describe functional requirements. Identify the actors, scenarios and use cases.

Explain how the steps will differ for identifying Class through sequence and collaboration modeling?

Consider the Hospital Management system application with the following requirements

- System should handle the in-patient, out-patient information through receptionist.
- Doctors are allowed to view the patient history and give their prescription
- There should be an information system to provide the required information

Model the relationship between a car (that has an engine and a color) and its owners (having a name) in a UML class diagram. A car can have several owners over time, but only one or none owner at a time.

### Analyse

Lee Turner is director of information systems (IS) for the city of Providence. The IS department customer are the public library, the fire department, the police department, the finance department, the sanitation department and the water department. Lee believes close communication with these customers is the key to meeting their needs. Currently, the police and fire department need fast access to a map of the city for dispatching the city ambulance and fire trucks to accident sites. Identify the actors.

Elucidate the needs of building high quality software and how it is useful in various real-time applications.

How can we build a high quality Software? Explain.

Give detailed notes about the Noun phrase approach, and apply the same to eliminate unwanted classes in Aircraft Maintenance System.

Illustrate with an example, the relationship between sequence diagram and use cases.

### Evaluate

Evaluate the activities involved in access layer design process?

Classify the following UML diagram types as static or dynamic diagram types:

- Class diagram
- State diagram
- Sequence diagram
- Interaction diagram
- Use case diagram
- Package diagram
- Deployment diagram

Justify for each diagram why it is a static or dynamic diagram type

Predict the steps to build a high quality Software.

Why user interface is one of the most important components of any software?

If you are in market to buy a car, which attributes or services are relevant to you?

### Create

Model the relationship between a car (that has an engine and a color) and its owners (having a name) in a UML class diagram. A car can have several owners over time, but only one or none owner at a time. Do not forget cardinalities, role names, attributes and their types.

Find out from your library about the coding system that is used for classifying books, videos, etc. Construct part of the structure in UML notation as a generalization hierarchy. Think up some attributes for classes in your model to show how the lower levels are progressively more specialized.
Course Objectives
Understand the basic concepts of communication and its types
Gain knowledge on various mobile communication technologies and their performances
Understand the process of satellite and optical fiber communication

Course Outcomes (COs)
Identify different communication systems, their working principles and applications
Analyze the performance of various digital modulation techniques
Understand the basic concepts of Mobile communication technologies and spread spectrum modulation

UNIT I
ANALOG COMMUNICATION
Elements of Communication systems - Basic principles of AM, FM and PM - Spectra - Power consideration - Receiver characteristics and detection of AM, FM and PM Systems performance.

UNIT II
PULSE MODULATION
Sampling process - Pulse Amplitude modulation - Pulse width modulation - Pulse position modulation - Bandwidth Noise trade off - Quantization process - Pulse Code Modulation - Noise considerations in PCM systems - Time Division Multiplexing.

UNIT III
DIGITAL MODULATION

UNIT IV
MOBILE COMMUNICATION TECHNOLOGIES
Wireless Communication - Multiple access techniques in Mobile communication - TDMA, FDMA, CDMA, W-CDMA, OFDMA, GSM technologies - RAKE receiver for wireless communication using CDMA.

UNIT V
SPREAD SPECTRUM MODULATION
Pseudo noise Sequences - A Notion of spread spectrum - Direct sequence spread spectrum - signal space dimensionality and processing gain - Probability of error - Frequency hopping spread spectrum.

FOR FURTHER READING
Survey on Satellite communication and optical Communication systems.

Total: 45 Hours

Reference(s)
Simon Haykin, Communication systems, John Wiley and Sons, 2013.

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>6 2</td>
<td>4 2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>2 4</td>
<td>6 4</td>
<td>6</td>
<td>2 4</td>
<td>2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2 6</td>
<td>6 4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2 4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
- Define Modulation and specify the needs for modulation.
- What are the advantages of single side band transmission?
- What is ISI?
- Draw the functional model of Pass band data transmission system.
- Define Digital Modulation.
- List the types of digital modulation.
- What are the suitable multiple access techniques for digital communication?
- Give the primary advantage of spread spectrum communication.
- Define processing gain.
- List the advantages of spread spectrum communication.

Understand
- Give the expression for AM modulated wave.
- What is slope overload distortion, and how it can be reduced?
- How to avoid aliasing effect?
- What is meant by quantization error?
- With a block diagram, explain the adaptive Delta Modulation technique.
- Which type of modulation technique is used to transmit analog signal in the form of digital pulses? What are the steps to be carried out for such modulation? Explain in detail.
- Draw the channel allocation diagram in TDMA, FDMA and in CDMA.
- List the various speech-coding techniques.
- Explain in detail about the concept of TDMA with its frame structure and the characteristics.
- Analyze the performance of Direct sequence spread coherent phase shift keying system based on interference and synchronization problem with its block diagrams.

Apply
- Draw the spectrum of AM signal.
- Find the total power radiated in AM transmitter if carrier power is of 50W and depth of modulation is 0.75.
- In an FM system, when the audio frequency (AF) is 500Hz and the AF voltage is 2.4V, the deviation is 4.8 KHz. If the AF voltage is now increased to 7.2V, what is the new deviation? If the AF Voltage is raised to 10V while the AF is dropped to 200Hz, What is the deviation?
- Find the modulation index in each case!
What are optimum and matched filters? Find there transfer functions? Is it true that in matched filter error probability depends on signal energy and not on wave shape? Explain. Why matched filter is called so? Derive the relationship between impulse response of the filter and the input signal and give explanation for matched filter. Why matched filter is called so? Derive the relationship between impulse response of the filter and the input signal and give explanation for matched filter. Why matched filter is called so? Derive the relationship between impulse response of the filter and the input signal and give explanation for matched filter. Discuss the maximum length sequence for PN generation and also list and prove the properties of the PN sequence. Derive the expression for bandwidth in Quaternary Phase Shift Keying technique and explain with neat block diagrams. With example explain the types of frequency hopping spread spectrum technique.

**Analyse**

What are the disadvantages of conventional (or ) Double side band full carrier system? Derive the expression for AM signal, power considerations for different side bands, efficiency and explain the process of modulation with necessary plots. With block diagram explain M-ary PSK Receiver. Compare M-ARY Modulation schemes. Which type of modulation is known as hybrid? Explain the constellation diagram and its properties. Compare the direct sequence spread spectrum and frequency hopping spread spectrum techniques based on its performance. Explain the generation of slow frequency, HOP spread M-ary FSK and fast frequency HOP spread M-ary FSK with appropriate diagrams. Compare the performance of TDMA, FDMA and CDMA with its applications. A spread spectrum communication system has the following parameters: Information bit duration (Tb) is 4.095 ms, PN chip duration (Tc) is 1 µs and the ratio Eb/N0 is of 10. Find the Jamming Margin in dB.

**Evaluate**

For an AM DSBFC transmitter with an un-modulated carrier power Pc=100W that is simultaneously modulated by 3 modulating signals with co-efficient of modulation m1=0.2, m2=0.4 and m3=0.5. Determine total co-efficient of modulation, upper and lower sideband power, total sideband power, total transmitted power and then draw the output spectrum. Illustrate the basic idea of correlative coding by considering the specific example of duo binary signaling.

**Create**

Modulate mobile data using Direct Sequence Spread Spectrum with Binary PSK Modulation. Instead of having towers everywhere for cell phones, why do they not have Satellites run all cell phone signals? If it is implemented, what are the parameters to be used?

**Course Objectives**

Introduce the basic concepts of computer networking and expose the core data communication protocols
Understand the functions of each layer and familiarize with contemporary issues in networking technologies
Course Outcomes (COs)

Understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks

Determine the proper usage of IP address, subnet mask and default gateway in a routed network

Describe, analyse and compare different protocols in each layer

UNIT I
DATA COMMUNICATIONS

UNIT II
DATA LINK LAYER
Introduction to Data Link Layer - Link Layer Addressing - Error Detection and Error Correction: Introduction, Block Coding, Cyclic Codes, Checksum, Forward Error Correction - Data Link Control: DLC services, Data-Link Layer Protocols, HDLC, Point-to-Point Protocol - Media Access Control: Random Access - Ethernet: IEEE 802.3 - IEEE 802.11.

UNIT III
NETWORK LAYER

UNIT IV
TRANSPORT LAYER

UNIT V
APPLICATION LAYER

FOR FURTHER READING
Simple Network Management Protocol (SNMP).

Total: 45 Hours

Reference(s)


**Assessment Pattern**

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Assessment Questions**

**Remember**

- List the layers of OSI Model.
- Mention the different types of transmission media.
- List out the protocols used for noiseless channels.
- What is Hamming distance?
- Mention the functions of Network layer.
- What is NAT?
- What attributes can be used to describe a flow of data?
- Give some well known port numbers of UDP.
- List out the three transmission modes of FTP.
- In electronic mail, what are the tasks of a user agent?

**Understand**

- What is the significance of the twisting in twisted-pair cable?
- Name the data units at different layers of the TCP/IP protocol suite.
- What is the need of bit-stuffing?
- How does a single-bit error differ from a burst error?
- What is a default mask in IPv4 addressing?
- Differentiate direct and indirect delivery.
- Differentiate between open-loop congestion control and closed-loop Congestion control.
- How back pressure method helps control congestion?
- Differentiate between a session and a connection in SSL.
- What is the importance of transfer encoding in MIME?

**Apply**

- Which transmission mode (Simplex, half-duplex, or full-duplex) can be compared to the following?
  - A heated argument between Husband and Wife.
  - A computer-to-monitor connection.
  - A polite conversation between HOD and Student.
  - A television broadcast.
- Compute the CRC generator and checker for a given a 10 bit data sequence “1010011110” and the divisor “1011”
The timer of a system using the Stop-and-Wait ARQ Protocol has a time-out of 6 ms. Draw the flow diagram for five frames if the round trip delay is 4 ms. Assume no data frame or control frame is lost or damaged.

Calculate the subnet mask for IP address 42.14.20.59/10.

Find the Network addresses, Broadcast address, Number of effective addresses/Subnet, Subnet ID and Host ID for the following IP Addresses Notation.
(a) 10.192.22.22/12
(b) 172.16.2.56/20

The following is the content of a UDP header in hex format. CB84000D001C001C
   What is the source port number?
   What is the destination port number?
   What is the total length of user datagram?
   What is the length of the data?
   Is the packet directed from a client to server or vice versa?
   What is the client process?

Suppose a TCP connection is transferring a file of 5000 bytes. The first byte is numbered 10,001. What are the sequence numbers for each segment if data are sent in five segments, each carrying 1000 bytes?

A sender sends a series of packets to the same destination using 6-bit sequence numbers. If the sequence number starts with 0,
   How many packets can be sent without repetition of sequence number?
   From which packet onwards the same sequence number will be repeated after two cycles.
   What is the sequence number after sending 545 packets?
   What is the maximum size of the send and receive windows for Go Back N ARQ and Selective Repeat ARQ protocols?

Design the CAMPUS LAN configuration of our institution and validate with a neat diagram.
(Note: Consider # of departments, # of Systems/Department, future expansion of the institution, # of servers required for an institution, allocation of IP addresses, etc.)

The following is a dump of a TCP header in hexadecimal format. 05320017 00000001 00000000 500207FF 00000000
What is the source port number?
What is the destination port number?
What is the sequence number?
What is the acknowledgment number?
What is the length of the header?
What is the type of the segment?
What is the window size?

Analyse
1. Analyze the following four networks and discuss the consequences if a connection fails.
   a. Five devices arranged in a mesh topology
   b. Five devices arranged in a star topology (not counting the hub)
   c. Five devices arranged in a bus topology
   d. Five devices arranged in a ring topology

Compare and analyze OSI reference model with TCP/IP Protocol Suite.

How many errors can be detected using simple parity check and two dimensional Parity-check? Explain.

With a neat diagram, explain the network configuration of our institution in terms of topology, transmission media and connecting devices.

What are the differences between classful addressing and classless addressing in IPv4? Differentiate Subnetting and Supermetting.

A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/28. What are the first address, last address and no. of addresses in the block?
Analyze Process to Process delivery with Host to host and Node to node delivery. Compare the outcomes of analysis.

Suppose Alice with a Web-based e-mail account (such as Yahoo! mail or Hotmail) sends a message to Bob, who accesses his mail from his mail server using POP3. Discuss how the message gets from Alice's host to Bob's host. Be sure to list the series of application-layer protocols that are used to move the message between the two hosts.

**Evaluate**

Find the range of addresses in the following blocks.

- 123.56.77.32/29
- 200.17.21.128/27
- 17.34.16.0/23
- 180.34.64.64/30

**Create**

Design the flow control diagram for the following problem: Suppose a computer sends a frame to another computer on a bus topology LAN. The physical destination address of the frame is corrupted during the transmission. What happens to the frame? How can the sender be informed about the situation? Justify your answer mentioning the selection of right protocol, if any.

An ISP is granted a block of addresses starting with 190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows:
- The first group has 64 customers; each needs 256 addresses.
- The second group has 128 customers; each needs 128 addresses.
- The third group has 128 customers; each needs 64 addresses.

Design the sub blocks and find out how many addresses are still available after these allocations.

15IT406 MICROPROCESSORS AND MICROCONTROLLERS

**Course Objectives**

- Study about the advanced architecture of microprocessors
- Learn the assembly language program of microprocessors
- Interface microprocessor with other devices
- Provide knowledge on fundamentals, design complexity, power, reliability and performance of microcontroller at all levels.

**Course Outcomes (COs)**

- Understand the fundamental features and operation of contemporary microcontroller and microprocessor
- Enumerate various architecture and memory organization of a typical 8086 and advanced microprocessor
- Develop assembly language source code for applications that use I/O ports, timer and single/multiple Interrupts.
- Design an interface that allows a microcontroller to communication with real time applications

**UNIT I**

**INTRODUCTION OF MICROPROCESSOR**

Evolution of microprocessor and types - 8086 microprocessor architecture, instruction set and assembler directives.
UNIT II 10 Hours
PROGRAM STRUCTURES IN 8086
Simple sequence program - Jumps, Flags and conditional flags - If-then else program - While do programs - Repeat - until programs - Instruction delay and timing loops - Strings – Procedures.

UNIT III 8 Hours
ADVANCED MICROPROCESSOR
Intel 80386 - 80486 architecture - ARM Processor Design Philosophy - Pipeline - Instruction set.

UNIT IV 10 Hours
COMMUNICATION INTERFACES
Interfacing I/O ports - PIO 8255, Modes of Operation of 8255 - Interfacing ADC - Interfacing DAC - Programmable Communication Interface 8251 USART.

UNIT V 10 Hours
INTRODUCTION TO MICROCONTROLLERS
Architecture of 8051 - Signal Description of 8051 - Register set of 8051 - Operational Features of 8051 - Memory and I/O Addressing by 8051 - Interrupts of 8051 - Instruction Set of 8051 - Microcontroller Applications.

FOR FURTHER READING
Case study on Pentium and AMD group of processors. 2 Hours

EXPERIMENT 1
Write an assembly language program to perform 16 bit arithmetic operations for 8086. (using Various Addressing Modes). 4 Hours

EXPERIMENT 2
Write an assembly language program to perform Binary to BCD code conversions. 4 Hours

EXPERIMENT 3
Write an assembly language program to perform Rolling Display. 2 Hours

EXPERIMENT 4
Write an assembly language program to perform USART Operation in 8051. 2 Hours

EXPERIMENT 5
Write an assembly language program to perform Interfacing Matrix/Keyboard to 8051. 4 Hours

EXPERIMENT 6
Write an assembly language program to perform Data Transfer from Peripheral to Memory through DMA controller 8237/8257. 4 Hours

EXPERIMENT 7
Write an assembly language program to perform Digital to analog conversion. 4 Hours

EXPERIMENT 8
Write an assembly language program to perform Analog to digital conversion.
EXPERIMENT 9
Write an assembly language Program to design digital clock using 8086.

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 3 2 2</td>
<td>3 2 2 2</td>
<td>3 2 4 5</td>
<td>4 3 2</td>
<td>2</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>3 2 2 2</td>
<td>2 4 3 4</td>
<td>3 2 3 4</td>
<td>5 3 3</td>
<td>3</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>3</td>
<td>2 4 2 2</td>
<td>3 4 3 4</td>
<td>2 4 3 4</td>
<td>5 3 3</td>
<td>3</td>
<td>6</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>4 2 2 2</td>
<td>4 2 3 4</td>
<td>7 3 3 6</td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>4 2 2 2</td>
<td>4 2 3 4</td>
<td>6 3 3 6</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
- List the internal parts of microprocessor.
- Define T-state.
- Define the terms:
  - Memory address
  - Machine code
- List the features of 8051.
- Label the data memory organization of 8051.
- List the cycles of DMA.
- List out two modes of operations present in 8086.
- Define brust transfer.
- Identify the priority schemes used in 8257 DMA.
- Define cascade mode.
- State the RAM organization of 8051.
- Recall clock signals are generated in 8085 microprocessor.
- Define Interrupt.

Understand
- Why semiconductor is used in design of electronic devices?
- Identify three different cycles of DMA operation.
- Identify three microcontrollers with power saving mode.
- ARM processors where basically designed for which purpose?
- Illustrate the internal architecture of 8251A (USART) with its two operating modes.
- Explain in detail about various operations performed by the microprocessor.
- Differentiate between opcode and operand.
Explain the functions of the following signals of 8086:

a) ALE
b) DEN

LOCK  
TEST  
MN/MX  
BHE  
READY  
NMI  
HOLD  
INTR

Illustrate the format of IE register of 8051 microcontroller and discuss its functions. Explain how baud rate is calculated for serial data transfer in mode1.

Apply

Why the data bus bi-directional?
Write an general algorithm for ADC interfacing.
Assume register B holds 93H and A holds 15H. Illustrate the results of instructions ORA B, XRA B, and CMA.
Load the accumulator A with the data byte 52H and save the data in register B.
Execute a program to
  - Clear A
  - Add 47H (use ADI)
  - Subtract 92H
  - Add 64H
  - Display results for c. and d. options

Specify the answers you would expect at the output ports.
Specify the reason for clearing A before adding the number 47H directly to A.

Write an assembly language program for 8085 MPU to do the following operations:
  - 8-bit addition
  - 8-bit subtraction
  - 8-bit multiplication
  - 8-bit by 8-bit division
Write a program to illustrate data transfer operations and arithmetic operations.
Execute a program to illustrate logic operations and branch operations.
Show the interfacing schematic of FDC 8272 with 8086 in non-DMA mode. Will this circuit be practically useful? Justify.
Represent various Instructions available in 8051 microcontroller and with example.

Analyse

Differentiate between register and memory.
Write instructions to load the hexadecimal numbers 65H in register C, and 92h in the accumulator A. Display the number 65H at PORT0 and 92H at PORT1?
Write a program to exchange the contents of memory locations 2000H and 4000H.
How DMA transfer the data faster?
Why to assemble all components in a PCB is not a affordable solution?
When building code for both ARM and Thumb states, which tool decides for each function call whether to use a BL or BLX instruction?
  - The linker
  - The archiver
  - The compiler
  - The assembler
7. How the keyboard is scanned and refreshed periodically?

Evaluate
Write a program to find the 1’s complement of the number stored at memory location 4400H and store the complemented number at memory location 4300H.
Write a program to shift an eight bit data four bits right. Assume data is in register C.
Write a program to add the 16-bit number in memory locations 4000H and 4001H to the 16-bit number in memory locations 4002H and 4003H. The most significant eight bits of the two numbers to be added are in memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H.
(i) Write a program to convert HEX to ASCII.
(ii) Program to implement BCD TO BINARY conversion.

Create
Construct a PIC microcontroller based washing machine.
Investigate the memory Performance and Scalability of pentium and AMD Processors.

15IT407 DATABASE MANAGEMENT SYSTEMS

LABORATORY

Course Objectives
Understand queries and maintain a simple database using Structured Query Language (SQL)
Learn different applications and constructs of PL/SQL
Present the concepts and techniques relating to ODBC and its implementations

Course Outcomes (COs)
Create database with different types of integrity constraints and use the SQL commands such as DDL and DML to access data from database objects
Construct stored procedures, stored functions and cursors using PL/SQL
Interface database with application program using JDBC and ODBC driver

2 Hours

EXPERIMENT 1
Data Definition Language.

2 Hours

EXPERIMENT 2
Data Manipulation Language.

4 Hours

EXPERIMENT 3
DQL Command to perform Nested and Join Queries.

4 Hours

EXPERIMENT 4
Views Creation and Manipulation.

2 Hours

EXPERIMENT 5
Functions and Procedures.

4 Hours

EXPERIMENT 6
Cursors and Triggers.

2 Hours

EXPERIMENT 7
Database connectivity techniques.
EXPERIMENT 8
Design and implementation of a Database Application.

EXPERIMENT 9
Report Generation in DBMS.

15IT408 COMPUTER NETWORKS LABORATORY

Course Objectives
- Give emphasis to the hands-on experience of networking issues in a real time environment
- Explore how abstract concepts are designed to work in real life and to observe how they really behave
- Understand the basics and working of the various networking protocols

Course Outcomes (COs)
- Understand and describe the devices and services used to support communications in data networks and the Internet
- Design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4
- Understand and describe the role of protocol layers in data networks

EXPERIMENT 1
Structured cabling, Patch panel and I/O module installation

EXPERIMENT 2
Hardware and Software Firewall - Configuration of Policies, Scheduling, Web filtering, Application filtering, Assigning of IP address and Bandwidth Monitoring

EXPERIMENT 3
Virtual LAN - Access Port and Trunk Port Configuration

EXPERIMENT 4
EXPERIMENT on packet capturing and analyzing tools

EXPERIMENT 5
Implementation of Flow Control algorithms

EXPERIMENT 6
Implementation of Data Link Framing Methods and CRC Polynomials

EXPERIMENT 7
Implementation of IP addressing classification and Routing algorithms

EXPERIMENT 8
Transport Layer: Datagram (UDP) socket programming

EXPERIMENT 9
Transport Layer: Stream (TCP) socket Programming
EXPERIMENT 10
Application Layer: SMTP and HTTP programming

4 Hours

Total: 30 Hours

15IT409 MINI PROJECT II

Course Objectives
To develop knowledge to formulate a real world problem and project's goals.
To identify the various tasks of the project to determine standard procedures.
To identify and learn new tools, algorithms and techniques.
To understand the various procedures for validation of the product and analysis the cost effectiveness.
To understand the guideline to Prepare report for oral demonstrations.

Course Outcomes (COs)
Formulate a real world problem, identify the requirement and develop the design solutions.
Express the technical ideas, strategies and methodologies.
Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
Prepare report and present the oral demonstrations.

15GE410 LIFE SKILLS: VERBAL ABILITY

Course Objectives
Read and understand the unseen passages with appropriate speed
Effectively deal with different kinds of structures
Develop strategies for vocabulary development

Course Outcomes (COs)
Improve their performance in the verbal ability sections of different competitive examinations.

UNIT 1
Synonyms - Antonym - Word groups - Verbal analogies - Etymology - Spellings - Critical Reasoning - Cloze Test - One Word Substitutes - Idioms and Phrases - Text Completion

15 Hours

UNIT 2
Sentence Formation - Sentence Correction - Sentence Improvement - Completing Statements - Sequencing of Sentences - Paragraph Formation - Instructions - Change of Voice - Change of Speech - Reading Comprehension - Sentence Equivalence

15 Hours

Total: 30 Hours
Reference(s)

15IT501 WEB TECHNOLOGY 3 0 0 3

Course Objectives
Study about designing web pages with the help of frames and scripting languages
Develop web sites which are secure and dynamic in nature using Javascript
Learn the importance of server-side scripts like JSP and servlets for web Interactivity and Web Hosting

Course Outcomes (COs)
Design a web-based information systems using HTML, DHTML and CSS
Use web application development software tools to design dynamic websites
Write the server side scripts using JSP and Servlets for web applications

UNIT I
INTRODUCTION TO WEB
8 Hours

UNIT II
SCRIPTING BASICS
9 Hours
HTML Basics - Forms - Tables - Links - DHTML - XHTML - CSS - Internal Style sheets - External Style sheets - PHP Basics - Dynamic Content - Form processing - XML - DTD - XSD.

UNIT III
SCRIPTING LANGUAGES
10 Hours
JavaScript - Variables - Statements - Popup Boxes - Functions - Loops - Error Handling - Date and String objects - Ajax Basics, Accessing database - JQuery.

UNIT IV
SERVLETS
9 Hours
Introduction- Servlet features - Servlet Overview Architecture - Three Tier Applications - Servlet package and API - Configuring Servlet - Handling HTTP Request - Get and post request - Redirecting request- Session Tracking and Cookies.

UNIT V
JAVA SERVER PAGES
9 Hours
Introduction - JSP architecture - Life cycle - JSP Tags and Implicit objects - JSTL - Core Tags - SQL Tags - Formatting Tags - JDBC - Accessing database
FOR FURTHER READING

Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>2 2 4 4</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>2 2 4 4 8</td>
<td></td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>26</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 2 2 2</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
List the elements of XSL.
Mention the default constraints of primary key.
State the page directives in JSP.
Name the methods of Response objects in ASP.
Explain about the installation, Configuration and Functioning of following web servers.
JBOSS
Apache Web Server Â
Describe about the ways of including style information in a HTML document using CSS and compare each of the style sheet types with Class and ID attributes.
Define SSI.
Describe the working principle of E-Mail system with all the protocols and show how to manage the E-mail during a hosting transfer.
Explain features and importance of AJAX.
How to read Cookies using the Request Object?

Understand
Compare and contrast HTML & XML
How do you create a new object in JavaScript?
How to create virtual directory in IIS?
Categorize DTD, XML Schema with XML.
How can I retrieve values from one database server and store them in other database server using PHP?
Summarizethe protocols needed for client server communication and show how to manage the E-mail during a hosting transfer with the working principle of E-Mail.
Give the use of onload and onclick event in web design.
Which statement is used to bind an image and table in webpage?
How can I enable session tracking for JSP pages if the browser has disabled cookies?
Illustrate with an example.
10. Difference between DHTML & XHTML.

Apply

Describe about the working principle of ASP with proper diagram, also briefly explain about the Filesystem Objects and Session objects in detail.
Prepare a suitable XML document on “Employee management system”. Also check whether the xml document is validated against XML schema or not.
Discover a suitable constraint on XML DTD and XML schema for the given XML document.
sample.xml
Everyday Italian
Giada De Laurentiis 2005
30.00
Write a Javascript for the HTML form that has a 4 number of Textboxes. When the form runs in the browser fill the Textboxes with data. Write JS code that verifies that all Textboxes have been filled. If a Textbox has been left empty, popup an Alert indicating which Textbox has left empty. When the Alert’s OK button is clicked on, set focus to that specific Textbox. If All the Textboxes are filled, display a Thank.
Design a HTML page with two links to an external document. The first link should lead to the beginning of the external document. The second link should lead to a particular section in the external document.
Construct the correct way to create a function in PHP for radio button & check box processing in a form.
Write a program in java script to switch between XHTML list formats using switch case statement.
Write a program in JavaScript to embed audio/video file with embed element.
Write a program in JavaScript to handle the redirection of HTTP requests.
Use a one dimensional array and write a script to solve the problem. Read in 20 numbers each of which is between 10 and 100. As each number is read, print it only if not duplicate of a number that is already read.

Analyse

Show the ASP code snippet for database connectivity using ADO for the following operations (i) insert the data into the database (ii) fetch the data from the database
Write a JSP code that takes the user’s name and age from a form. Echo back the name and age along with a message stating the price of movie tickets. The price is determined by the age passed to the JSP. If the age is greater than 62, the movie ticket price is Rs 7.00. If the user is less than 10 years old, the price is Rs 5.00.
Construct a Servlet program to display the session details of the client request and display the Session ID, Last access time, creation time and No of times visited details in HTML.
Write an asp code for the following operations and trace each operation with suitable inputs.
Set a date/time when a page cached in a browser will expire.
How to use information from forms.
Analyze the different data models of the real world databases and explain the relational data model with an instance of student’s relation.

Evaluate

Construct a Servlet that lets a user vote for his favorite food from a combo box or radio buttons (the user must be able to make multiple food selections per request). Store the favorite foods and the number of votes for each food. Display all foods and their number of votes in alphabetical order back to the user. Use an appropriate Collection class or Map class to store the data.
Convert the given information into a XML file and then convert this XML File data into HTML file as it is. Also validate the XML Document with DTD Schema.

<table>
<thead>
<tr>
<th>Roll</th>
<th>name</th>
<th>subject code</th>
<th>marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>122IT101</td>
<td>Raj</td>
<td>101</td>
<td>78</td>
</tr>
<tr>
<td>122EC102</td>
<td>Kumar</td>
<td>501</td>
<td>84</td>
</tr>
<tr>
<td>111CS103</td>
<td>vengatesh</td>
<td>202</td>
<td>85</td>
</tr>
</tbody>
</table>

Prompt a user for the cost price and selling price of an article and output the profit and loss percentage.

Create an HTML page named DeleteAllCookies.asp. Write code that will delete all the cookies your Web site has created on the client' computer.

Create a button in your page. On clicking that button, it will display the following: a) Name of the window. b) Color of the page. c) Last modified date. d) Location of your HTML file. e) Name of the button that is clicked.

Create

Create a web page of customer profile for data entry of customer’s in a Hotel, The profile should include Name, Address, Age, gender, Room Type (A/C, Non- A/C or Deluxe), Type of payment (Cash, Credit/Debit Card or Coupons).

Create a HTML form that has a number of Textboxes. When the form runs in the browser fill the Textboxes with data. Write JS code that verifies that all Textboxes have been filled. If a Textbox has been left empty, popup an Alert indicating which Textbox has left empty .When the Alert’s OK button is clicked on, set focus to that specific Textbox. If All the Textboxes are filled, display a Thank.

15IT502 SYSTEM PROGRAMMING AND OPERATING SYSTEMS

Course Objectives
Understanding the role of system software in improving the system performance
Learn the importance of Operating System and its functionalities
Obtain insight into the design of an operating system

Course Outcomes (COs)
Understand the basic concepts and functions of various system software and develop programs
Analyze various problems in Synchronization and solutions for those problems
Aware of the issues in the management of resources like process, memory and input-output

UNIT I
9 Hours
ASSEMBLER AND COMPILER
SIC/SIC XE - assembler machine dependent and machine independent assembler features - one pass assembler, two pass assembler - multipass assembler compilers introduction - structure of a compiler - phases of a compiler.

UNIT II
9 Hours
LINKER AND LOADER
UNIT III

PROCESS MANAGEMENT

UNIT IV

MEMORY MANAGEMENT

UNIT V

I/O MANAGEMENT AND FILE ORGANIZATION

FOR FURTHER READING
Embedded Operating Systems: Characteristics of Embedded Systems, Embedded Linux, and Application specific OS - Introduction to Service Oriented Operating System.

EXPERIMENT 1
Unix commands and shell programming

EXPERIMENT 2
Simulation of Pass 1 and pass 2 of the two pass assembler

EXPERIMENT 3
Simulation of a single pass assembler

EXPERIMENT 4
Simulation of Linker and Loader

EXPERIMENT 5
Interprocess Communication using pipes

EXPERIMENT 6
Simulation of CPU Scheduling algorithms

EXPERIMENT 7
Implementation of page replacement Algorithms

EXPERIMENT 8
File Manager implementation – open, close, read, write, seek, delete

EXPERIMENT 9
Simulation of memory management Schemes
EXPERIMENT 10
Unix commands and shell programming

Total: 75 Hours

Reference(s)


Hans-Erik Eriksson, Magnus Penker, Brain Lyons and David Fado, UML Toolkit, OMG Press Wiley Publishing Inc., 2010

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember F</th>
<th>Understand F</th>
<th>Apply C</th>
<th>Analyse P</th>
<th>Evaluate M</th>
<th>Create F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>5</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

Name the registers present in SIC and SIC/XE.
What are the assembler directives?
Name the fields present in defines and text record.
List the uses of a relocation bit.
What is a compiler?
What is an operating system?
List the different categories of system calls.
Define response time.
How can the system recover from deadlock?
What is process control block?

Understand

How indirect, immediate and simple addressing mode is indicated using bits n, i, x, b,p and e?
How are LABELS entered in SYMTAB and when are they referred?
Can you explain how program relocation is indicated and handled by assemblers?
Why fixed partition is not suitable for multi programming?
Summarize the design of an editor.
How would you classify the phases of compiler?
Since protecting hardware unit from user is crucial in Operating system design, How Should the operating system designer must protect I/O devices, memory and CPU from user?
Consider one file is in optical device and you need to copy that file into pen drive. Illustrate the concepts of System Calls using above scenario and group them into process, file system and Information maintenance system calls.
What steps must the Linux developers take to ensure that the system is portable to different processors and memory - management architectures, and to minimize the amount of architecture-specific kernel code?
What is the main difficulty that a programmer must overcome in writing an operating system for real-time environment?

Consider a variation of round-robin we will call progressive round-robin. In progressive round-robin, each process has its own time quantum. This starts out at 50 ms, and increases by 50 ms each time it goes through the round-robin queue. Give the advantages and disadvantages of this variant over ordinary round-robin.

**Apply**

How would you use the SIC instruction to swap values of two numbers?

Identify the difference between the following sequences of statements.

```
LDA #3
THREE EQU 3. . LDA #THREE
THREE EQU 3. . LDA THREE
```

In SIC/XE, what is the difference between simple addressing and immediate addressing?

What is the purpose of Test Device instruction?

Consider the following set of processes, with the length of CPU-burst time given in milliseconds:

<table>
<thead>
<tr>
<th>Process</th>
<th>Burst Time</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>P2</td>
<td>200</td>
<td>2</td>
</tr>
<tr>
<td>P3</td>
<td>300</td>
<td>1</td>
</tr>
<tr>
<td>P4</td>
<td>400</td>
<td>4</td>
</tr>
<tr>
<td>P5</td>
<td>500</td>
<td>5</td>
</tr>
</tbody>
</table>

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0. Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non pre-emptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.

Consider that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from the current head position, what is the total distance that the disk arm moves to satisfy all the pending requests, for each of the disk scheduling algorithms?

Which algorithm makes the most efficient use of memory? Given memory partitions of 100K, 500K, 200K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order)? Assume that a system consists of four processes of same type, they are shared by three resources, each of which needs almost two resources. Show that the system is deadlock free.

What are the three requirements that a solution to the critical-section problem satisfy?

What is the need for condition variables in monitors and how are they different from conventional variables?

**Analyse**

How would you analyze the source program errors that could be detected during lexical analysis?

How programmers decide whether to use a macro or a sub routine to accomplish a given logical function?

Suppose we want macro definitions to appear as a part of the assembly listing, how could the macro processor and the assembler accomplish this?

How could a recursive macro processor be implemented in assembler language?

A barbershop consists of a waiting room with n chairs and the barber room containing the barber chair. If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy but chairs are available, then the customer sits in one of the free chairs. If the barber is asleep, the customer wakes up the barber. Apply process synchronization technique to coordinate the barber and the customers.

Consider the following page reference string:

```
1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.
```

How many page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six, or seven frames? Remember all frames are initially empty, so your first unique pages will all cost one fault each.
LRU replacement
FIFO replacement
Optimal replacement

What does an assembler perform when it encounters LTORG assembler directive?
What is the purpose of relocation bit in object code of relocation loader?
Compare Linking loader and linkage editor
Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames.
   a. How many bits are there in the logical address? b. How many bits are there in the physical address?

Create
Write a program to indicate the CPU utilization time of current running process using various scheduling algorithms.
Write a program that implements the FIFO and LRU page-replacement algorithms. First generate a random page reference string where page numbers range from 0 to 9. Apply the random page-reference string to each algorithm and record the number of page faults in each algorithm.

15IT503 COMPUTATIONAL THEORY AND COMPILERS

Course Objectives
Acquire knowledge of Automata Theory as the basis of all computer science languages design
Learn the tools used for Lexical and Syntax analysis
Enrich the knowledge in various phases of compiler and its use

Course Outcomes (COs)
Design Finite State Machine and Pushdown Automata
Understand the types of grammars and use them to build languages
Understand code optimization techniques to improve the performance of a program in terms of speed & space

UNIT I
FINITE AUTOMATA
Introduction - Basic Mathematical Notation and techniques - Finite State systems - Basic Definitions - Finite Automaton - DFA & N DFA - Regular Languages - Regular Expression - Equivalence of NFA and DFA - Equivalence of NDFAs with and without input moves - Equivalence of finite Automaton and regular expressions - Minimization of DFA.

UNIT II
GRAMMARS AND PUSHDOWN AUTOMATA

UNIT III
LEXICAL ANALYSIS
Introduction to Compiling - The grouping of phases - Compiler construction tools - The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens - A language for specifying lexical analyzer.
UNIT IV
SYNTAX ANALYSIS
8 Hours
Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top-down parsing - Bottom-up Parsing - SR parsers - LR parsers - Constructing an SLR(1) parsing table - Type checking - Type Systems - Specification of a simple type checker.

UNIT V
CODE GENERATION AND OPTIMIZATION
10 Hours
Intermediate languages - Declarations - Assignment statements - Boolean expressions - Case statements - Backpatching - Procedure calls - Issues in the design of a code generator - The target machine - Run-time storage - management - Basic blocks and flow graphs - Next-use information - A simple code - generator - Register allocation and assignment - The dag representation of basic blocks - Generating code from DAGs.

FOR FURTHER READING
The recursion theorem - Decidability of logical theories - Turing reducibility. Total: 45+30=75 Hours

Reference(s)

Assessment Pattern
<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td>6</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td></td>
<td>4</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td></td>
<td>6</td>
<td>2</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
<td></td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total 100

Assessment Questions
Remember
State the pumping lemma for regular languages.
Define Pushdown Automata.
Define Diagonalization Language.
List any four additional forms of proof.
Define Turing machine with its notation.
Define handle pruning.
List any four function preserving transformations on basic blocks.
Define DAG.
State the syntax directed translation for if-else statement.
List the three types of error recovery procedures used in syntax analyzer.

Understand
1. Explain the syntax directed translation for assignment statements.
Explain the 8 phases of compiler.
Exemplify the role of lexical analyzer
Explain the role of parser in compilation.
Summarize the principal sources of optimization.
Represent in DFA for accepting strings of a’s and b’s with atmost two consecutive a’s.
Summarize the closure properties of regular languages
Summarize the relation between PDA and CFG with suitable theorem
Explain the programming techniques of Turing machines
Explain inductive proof with suitable diagram

Apply
1. Construct a DFA for the regular expression a*
2. Construct a syntax tree for the regular expression (a/b)*a
3. Show the construction of basic blocks for the quick sort program segment.
4. Show the optimization on basic blocks with an example.
5. Show the program translation process for a program segment.
6. Show the significance of PDA.
7. Illustrate the language acceptance of a DFA with an example.
8. Implement the following by the principle of Induction For all n ≥ 0 : ∑ i2 = (n(n+1)(2n+1))/6
9. Construct epsilon NFA for the regular expression (a/b)(a/b)(a/b)
10. Demonstrate the encoding technique of Universal TM with an example.

Analyse
DAG representation is more suitable than syntax tree for the intermediate code representation. Justify
Compare the top-down and bottom-up parsers.
Compare compiler and interpreter
Differentiate NFA and DFA.
Differentiate PDA and TM

Evaluate
Determine whether the following grammar is ambiguous or not E→E+E|E-E|id
Determine the source language issues involved in the code generation phase of a compiler
Check the ambiguity in the arithmetic grammar.
Check that the given CFG is ambiguous S→0B|1A
A→0|0S|1AA
B→1|1S|0BBA
Is the language L={aibcjl s<j<k} a CFL? Justify

Create
Generate a three address code, basic blocks and flow graph for the programming segment of Quick sort.
Generate a derivation tree for the string aabbaa with the given production S→aAS|a,
A→SbA|SS|bA

Course Objectives
- Study the classification and analyse discrete time signals and systems
- Design systems for the given specification
- Learn the finite word length effects in real time processing

Course Outcomes (COs)
Understand and analyze different types of signals and systems
Design a digital IIR filter from analog filter using suitable transformation techniques
Design a digital FIR filter using different windowing techniques and implement it for different applications.

Analyze the finite word length effects in real time processing and use the concepts in signal processing applications.

UNIT I

8 Hours

SIGNALS AND SYSTEMS
Continuous and discrete time signals - Classification of Discrete time signals: Periodic and Aperiodic
Even and Odd - Energy and Power signals - Deterministic and Random signals - Complex exponential and Sinusoidal signals - Periodicity - Analysis of Linear time invariant systems using Convolution.

UNIT II

8 Hours

ANALYSIS OF DISCRETE TIME SIGNALS

UNIT III

10 Hours

IIR FILTER DESIGN
Butterworth and Chebyshev approximations - Design of Discrete time IIR filter from continuous time filter - IIR filter design by Impulse Invariance method, Bilinear transformation method - Structure of IIR System.

UNIT IV

10 Hours

FIR FILTER DESIGN
Linear phase filter - Symmetric and Anti-symmetric FIR filters - Windowing technique: Rectangular, Hamming, Hanning windows - Frequency sampling techniques - Structure for FIR systems: Direct form, Linear phase realization structure.

UNIT V

9 Hours

FINITE WORD LENGTH EFFECTS
Quantization noise - Over flow error - Truncation error - Limit cycle oscillation - Signal scaling - Interpolation and Decimation: Decimation by an integer factor - Interpolation by an integer factor - Sampling rate conversion by a rational factor.

FOR FURTHER READING

Case study on digital signal processors.

Total: 45 Hours

Reference(s)

**Assessment Pattern**

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FCPM</td>
<td>FCPM</td>
<td>FCPM</td>
<td>FCPM</td>
<td>FCPM</td>
<td>FCPM</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>32</td>
<td>54</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>22</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>32</td>
<td>43</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>33</td>
<td>44</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>33</td>
<td>44</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

**Assessment Questions**

**Remember**
- List the properties of convolution.
- Differentiate energy and power signal.
- Define Z-transform and ROC.
- State initial value theorem and final value theorem.
- Mention the effect of Gibb’s phenomenon.
- What are the design techniques available for the designing FIR filter?
- Give the necessary and sufficient condition for the linear phase characteristic of FIR filter?
- Define Multirate signal processing.
- Write the characteristics features of rectangular window.
- Which of the following is used to alter FIR filter coefficients so they smoothly approach zero at both ends?

**Understand**
- How many multiplications and additions are involved in radix-2 point FFT?
- Elucidate the three stage of butterfly structure for DIT FFT algorithm.
- What is the drawback of rectangular window in FIR filter design?
- What is the equation to find Quantization error?
- What is the process of reducing the sampling rate?
- Define warping effect and how it can be eliminated.
- Explain the characteristics of a limit cycle oscillation with respect to the system described by the equation $y(n) = ay(n-1) + x(n)$. Determine the dead band of the filter.
- Draw the 2 point butterfly diagram of DIT-FFT algorithm and DIF-FFT algorithm.
- What are the basic building blocks to realize any structure?

**Apply**
- Using frequency sampling method, design a band pass filter with the following specifications Sampling frequency $F_s=8000$Hz, cut off frequency $F_{c1}=1000$Hz and $F_{c2}=3000$Hz. Determine the filter coefficients for $N=7$.
- Derive the Fourier series method of designing FIR filter and the effect of Gibb’s phenomenon.
- Obtain Z transform of $x(n)=\{1,2,3,4\}$.
- Find DFT of the sequence $x(n)=\{2,1,2,1,2,1\}$ using DIT FFT algorithm.
- Perform the linear convolution for the given sequence and verify the result using tabulation method $x(n)=\{3,-6,2,1,7,2\}$ and $h(n)=\{1,2,1,2\}$.
- Derive and explain the sampling rate conversion process by the factor I and I/D with its spectrum.
- With neat diagram and supportive derivation explain multi rate signal processing using decimation techniques.
- Apply impulse invariant method to design a digital filter for $T=0.2$ sec, where the analog filter transfer function is given as $H(S) = \frac{10}{(S^2+3S+2)}$.
- When does Warping effect is occur?
- How analog frequency is mapped to digital frequency in bilinear transformation?
Analyse
What will be the output of a system if the input is \( x(n) \) and impulse response of the system is \( h(n) \)?
If \( x(n) \) is a sequence of \( L \) number of samples and \( h(n) \) with \( M \) samples, after convolution \( y(n) \) will have how many samples
Why rectangular window are not used in FIR filter design using window method?
If \( x(n)=0.92465 \) and quantized by 3 bits using truncation method, What is the quantization error?
How will you determine the error range for truncation and round-off process?
Derive the expression for steady state input noise power and steady state output noise power due to quantization error.

Evaluate
Test whether the following signals are periodic or not and if the signal is periodic, Calculate its fundamental period
\[ x(n) = \cos(6\pi n) \]
\[ x(n) = \sin(100\pi t) \cos(150\pi t). \]

Create
How do I test my FIR implementation?
How to implement a FIR resampler using coefficient constant

Course Objectives
- Understand various Scripts like HTML, XML and JavaScript
- Study the various rich internet applications using Ajax
- Learn the server side programming using JSP and Servlets

Course Outcomes (COs)
- Build interactive web applications using HTML, DHTML and CSS
- Design dynamic web pages using AJAX, PHP and XML
- Implement the web authoring tools with the database design for web development

EXPERIMENT 1
Create a webpage using HTML Elements and Frames

EXPERIMENT 2
Use Cascading Style sheets for designing the DHTML web page

EXPERIMENT 3
Design a dynamic web page with validation using JavaScript

EXPERIMENT 4
Create the DTD and XML Schema to validate XML File

EXPERIMENT 5
Design a web page using PHP with MySQL as backend
EXPERIMENT 6
Create a AJAX program to Receive data and Process XML Objects in the DOM
2 Hours

EXPERIMENT 7
Demonstrate a web application with Servlets
4 Hours

EXPERIMENT 8
Write the JSTL Formatting tags to design and validate web forms
4 Hours

EXPERIMENT 9
Implement a JSP script to access information from a Database using JDBC
4 Hours

EXPERIMENT 10
Design a web catalogue with JSF

Total: 30 Hours

15IT508 DIGITAL SIGNAL PROCESSING LABORATORY

Course Objectives
Understand the processes of analog-to-digital and digital-to-analog conversion
Understand the concept of Multi-rate signal processing and sample rate conversion
Learn the basic forms of FIR and IIR filters, and how to design filters with desired frequency responses.

Course Outcomes (COs)
Understand and analyze different types of signals and systems
Apply Sampling theorem and Compute the output response of the system, sampling rate conversion and FFT spectrum.
Design digital FIR filters using different windowing techniques
Design digital IIR filters from analog filter using suitable transformation techniques

EXPERIMENT 1
Generate standard discrete time signals which are used in real time systems.
2 Hours

EXPERIMENT 2
Sample the continuous time signal by different sampling rate, verify the sampling theorem. With the results find the effect of aliasing.
6 Hours

EXPERIMENT 3
In an LTI system the input signal is of x (n) and the impulse response of the system is of h (n). Find the output of the system using the concept of Convolution. (LTI systems like Amplifier, filters, modulators can be considered as the given system)
4 Hours

EXPERIMENT 4
Convert the given time domain signal into frequency domain signal with minimum number of operations.
EXPERIMENT 5
Using Rectangular, Hamming and Hanning windows design FIR filter for different band specifications.

EXPERIMENT 6
Design an analog Butterworth and Chebyshev filters and convert them into digital IIR filters

EXPERIMENT 7
Perform interpolation and decimation process for a sinusoidal signal

EXPERIMENT 8
Record the speech signal in a noisy and clean environment and obtain the enhanced speech signal using speech enhancement techniques

Total: 30 Hours

15IT509 TECHNICAL SEMINAR I

Course Objectives
To develop the self-learning skills to utilize various technical resources available from multiple field.
To promote the technical presentation and communication skills.
To impart the knowledge on intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.

Course Outcomes (COs)
Refer and utilize various technical resources available from multiple field.
Improve the technical presentation and communication skills.
Understand the importance of intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
Interact and share their technical knowledge to enhance the leadership skills.
Understand and adhere to deadlines and commitment to complete the assignments.

15IT510 MINI PROJECT III

Course Objectives
To develop knowledge to formulate a real world problem and project's goals.
To identify the various tasks of the project to determine standard procedures.
To identify and learn new tools, algorithms and techniques.
To understand the various procedures for validation of the product and analysis the cost effectiveness.
To understand the guideline to Prepare report for oral demonstrations.
Course Outcomes (COs)
Formulate a real world problem, identify the requirement and develop the design solutions.
Express the technical ideas, strategies and methodologies.
Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
Prepare report and present the oral demonstrations.

15GE511 LIFE SKILLS: APTITUDE I

Course Objectives
To expose the undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values.

Course Outcomes (COs)
Distinguish the pattern of coding and decoding.
Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions
Difference between sequence and series
Evaluate critically the real life situations by resorting and analyzing analytical reasoning of key issues and factors
Identify the odd man out
Calculate the percentages and averages
Demonstrate the blood relation concept in Verbal Reasoning
Plot the diagrams based on direction
Explain the various operations

3 Hours

CODING AND DECODING
Introduction - Description of Coding method - Coding patterns - Concepts of Coding and Decoding - Problems involving Coding and Decoding methods

3 Hours

SEQUENCE AND SERIES
Introduction - Sequences of real numbers - Number and Alphabet series - Description of Number and Alphabet series - Analogy - Odd man out- Power series

3 Hours

DATA SUFFICIENCY
Introduction to Data Sufficiency - Overview of the wide variety of Data Sufficiency problems - Basic introduction on how to determine what information is sufficient to solve a given problem - Common pitfalls to avoid

3 Hours

DIRECTION
Introduction to Direction - sense test - Overview of the wide variety of Direction problems - Direction - Plotting diagrams
PROBLEM ON AGES
Introduction- basic concept - usage of percentage and averages- applications 3 Hours

ANALYTICAL REASONING
Introduction - basic concept - non verbal analytical reasoning - arrangements 3 Hours

BLOOD RELATION
Introduction - Basic concept - Kinds of relation - Tree diagram - Relations 3 Hours

BLOOD RELATION
Introduction -Basic concept - Kinds of relation - Tree diagram - Relations 3 Hours

VISUAL REASONING
Introduction - Basic concepts - Odd man out - Next series - Mirror image and water image 3 Hours

SIMPLIFICATIONS
Introduction - Basic concepts - Arithmetic operations -Equation solving methods - Puzzles 3 Hours

Total: 30 Hours

Reference(s)

15GE701 ENGINEERING ECONOMICS
Common to CSE,ECE,EEE,EIE,IT (VI Semester)
AE, AG,AU,CE,ME,MTRS,BT,FT,TT (VII Semester)

Course Objectives
Provide the theoretical foundations in micro and macro analysis in terms of concepts and theories
Emphasis the systematic evaluation of the costs and benefits associated with projects
Enumerate the idea of Balance sheet and Balance of payments

Course Outcomes (COs)
Understand the micro economic environment for creating a favourable business environment.
Take decision by making use of the major concepts and techniques of engineering economic analysis.
Compare the cost of multiple projects by using the methods learned, and make a quantitative decision between alternate facilities and/or systems.
Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.
Examine and evaluate the issues in macro-economic analysis.
UNIT I
INTRODUCTION

UNIT II
DEMAND AND SUPPLY

UNIT III
PRODUCTION AND COST

UNIT IV
MARKET STRUCTURE

UNIT V
INTRODUCTION TO MACRO ECONOMICS AND FINANCIAL ACCOUNTING

FOR FURTHER READING
Nature and characteristics of Indian Economy - Role and functions of Central bank - LPG - GATT - WTO.

Total: 45 Hours

Reference(s)
S N Maheswari, Financial and Management Accounting, Sultan Chand
V L Samuel Paul and G S Gupta, Managerial Economics-Concepts and Cases

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyze</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>
Assessment Questions

Remember

Define Economics
What is opportunity cost?
List the types of Demand.
State the law of Demand.
Define Elasticity of Demand.
State the different degrees of elasticity of Demand?
List the factors determining Elasticity of Demand?
State the Law Of Diminishing Marginal Utility.
Define Replacement Cost and Historic Cost
Define Monopoly.
Define Oligopoly.
Name the two types of Oligopoly.
List the objectives of Pricing?
Define Accounting.
Define inflation.

Understand

Explain the nature and scope of Economics.
List and explain the focus areas of Managerial economics.
Give reasons why managers aim to maximize sales even at the cost of a lower profit.
Explain the nature of Demand.
What are the assumptions made when talking about the Law of Diminishing Marginal Utility?
Explain the characteristics of the Indifference Curve with examples.
Can Demand Forecasting principles be applied to Services? Substantiate your answer with an example.
What are the characteristic features of an oligopoly industry?
What causes Oligopoly?
Explain the types and features of Cost Based Pricing.
Explain the types and features of Demand Based Pricing.
Under what conditions does a company go in for Cross Subsidization pricing?
What is the role of the Central bank in controlling inflation?

Apply

Explain decisions based on the degree of certainty of the outcome with examples.
Give examples of products falling under the various kinds of competition, and the reasons they are able to survive in the market.
Give six examples of products that fall under Monopolistic Competitive pricing.
Give six examples of products that fall under Oligopolistic pricing.
Pick any six Consumer Items and based on your knowledge of the markets, explain the pricing method that you think is most likely to have been followed for each of these items.

Analyse

Differentiate between Macro and Micro economics.
Differentiate between Extension and Increase in Demand.
Distinguish between Cost and Price.
Compare the merits and demerits of the Deductive Method and the Inductive Method of Investigation.
The per-capita income of farmers in the country has to be raised by 20% this year to prevent their migration to cities. Discuss this statement from the point of view of Positive and Normative Economics.

Decision making improves with age and experience- Discuss.

Do a survey of the automotive (only cars) industry and analyze the reasons and timing for discounts offered from the point of view of elasticity of demand

How would you modify a sealed bid pricing system to take care of different technical approaches by different bidders for a project for which bids are called for, given that the cost varies depending on the technical approach?

Create

Create a matrix consolidating the definitions of the word ??? Economics as defined by the leading Economists in the prescribed textbook. Using this define economics the way you understand it, in less than 50 words.

Study the price of a commodity over a period of one year and explain the possible reasons for the fluctuations from an economist’s point of view

You are in a job which is paying you adequately. You are called for an interview for a job that double your salary. Unfortunately you miss the only train that will take you in time for the interview. How will you justify the cost of taking a flight considering the cost concepts you have learnt.? Due to cancellation of an export order, you are stuck with a huge stock of jeans of international quality. Device a pricing strategy for disposing this stock without incurring a loss, considering that it is a very competitive market.

15IT602 DATA MINING AND ANALYTICS

Course Objectives

Gather and analyze large sets of data to gain useful business understanding

Understand the data mining functionalities, technologies and steps in preprocessing the data

Learn data mining algorithms, methods and tools

Course Outcomes (COs)

Design data warehouse by applying principles of dimensional modelling and ETL concepts

Implement frequent item sets mining algorithms for generating association rules

Apply classification, clustering and mining algorithms for data analytics

UNIT I

DATA WAREHOUSING

Need for data warehouse - Building blocks - Principles of dimensional modeling:Star schema,Snowflake schema and Galaxy schema - Data extraction - Transformation and Loading - OLAP models.

UNIT II

DATA MINING

Data Mining Functionalities - Technologies in Data Mining - Major Issues - Data objects and attribute types - Statistical Description of data - Measuring data similarity and dis-similarity - Data Cleaning - Data Integration and Transformation - Data Reduction - Discretization - Concept Hierarchy Generation.
UNIT III

CLASSIFICATION
Decision Tree Induction - Naive Bayes classification - Rule based classification - Classification by Back propagation - Support Vector machine.

UNIT IV

ASSOCIATION RULE MINING AND CLUSTERING

UNIT V

ADVANCED TOPICS
Text mining - Mining the world wide web - Applications and trends in data mining - Spatial Data Mining - Multimedia Mining.

FOR FURTHER READING
Case study on big data analytics.

Total: 45 Hours

Reference(s)
Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Second Edition, Elsevier, 2012.

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  C   P</td>
<td>F  C   P</td>
<td>F  C</td>
<td>F  C</td>
<td>F  C</td>
<td>F  C</td>
<td>F  C</td>
</tr>
<tr>
<td>1</td>
<td>2  4   3</td>
<td>4  3   2</td>
<td>2  4</td>
<td>4  3</td>
<td>4  3</td>
<td>4  3</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>2  2   2</td>
<td>4  4   4</td>
<td>2  4</td>
<td>2  4</td>
<td>2  4</td>
<td>2  4</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2  2   4</td>
<td>2  4   4</td>
<td>2  4</td>
<td>2  4</td>
<td>2  4</td>
<td>2  4</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2  4   4</td>
<td>2  4   4</td>
<td>4  4</td>
<td>4  4</td>
<td>4  4</td>
<td>4  4</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>2  4   4</td>
<td>2  4   4</td>
<td>3  4</td>
<td>3  4</td>
<td>3  4</td>
<td>3  4</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
Define Data warehouse.
Define Pre Pruning.
What is Data Mart?
List out the OLAP operations.
State the goals of Data Mining.
State the limitations of Data Warehouse.
Define Frequent item set.
What are the steps followed in Back Propagation?
Write the three tiers in Data warehouse Architecture.
What is Content-Based retrieval?

Understand
Write the transformation tools used in Data Warehouse?
How a database design is represented in OLAP systems?
How concept hierarchy is generated?
How the different layers of warehouse architecture differ from each other?
What are the requirements for cluster analysis?
How the decision tree induction classifies data?
What are the factors involved while choosing data mining system?
How data mining is used in banking industry?
How the efficiency of apriori is improved?
What is the purpose of anti-monotone property in apriori algorithm?

Apply
Illustrate the smoothing techniques in cleaning the data and apply on the data set. 2,25,2,1,1,5,4,25,36
Identify the frequent item set using apriori algorithm for, M,O,N,K,E,Y
D,O,N,K,E,Y
M,U,C,K,Y
D,U,C,K,Y
K,E,Y
Identify the attributes for hotel management system and perform the OLAP operations for the same.
Explain the design and construction of data warehouse.
How does support differ from confidence in market basket analysis?
Show the rollup and drilldown for the following:
   City
   Consumer products
How does the k-means algorithm classify the data?
Show with an example how the input, output and hidden layer works with back propagation.
Given frequent set {A, B, E}, what are possible association rules? A=>B, E
   A, E=>B
   B=>A, E
   B, E=>A
   E=>A, B
=>A, B, E (empty rule), or true=>A, B, E
How the frequent item sets are generated with the candidate keys?

Analyse
Describe the method of generating frequent item sets without candidate generation.
Differentiate between OLTP and OLAP operations.
Compare data mining and data warehouse.
How to generate association rules from frequent item sets?
Distinguish between multidimensional and multi-relational OLAP.
How the Support Vector machine is used in classification?
Compare MOLAP and HOLAP.

Evaluate
How data mining system can be integrated with a data warehouse? Discuss with an example.
Decision tree induction is a popular classification method. Taking one typical decision tree induction algorithm, briefly outline the method of decision tree classification.
Justify how computations can be performed efficiently on data cubes.

Create
Discuss the current trends in data mining.
How the preprocessing step is done in hospital management system?
15IT603 INFORMATION CODING TECHNIQUES

Course Objectives
Introduce information theory and further use it to develop compression algorithms.
Study the principles behind compressing audio, image and video signals.
Study the fundamentals of error control coding and design suitable techniques.

Course Outcomes (COs)
understand the principles behind modeling data and design data compression algorithms
analyse and design data compression algorithms for text, speech and image and multimedia
understand the need for channel coding and design efficient channel coders

UNIT I
INFORMATION ENTROPY FUNDAMENTALS
9 Hours
Uncertainty - Information and Entropy - Source coding Theorem - Shannon Fano coding - Huffman coding: static and dynamic - Discrete Memory less channels - Channel coding Theorem - Channel capacity - Channel capacity Theorem.

UNIT II
DATA AND VOICE CODING
9 Hours

UNIT III
IMAGE CODING
9 Hours

UNIT IV
MULTIMEDIA CODING
9 Hours
Perceptual coding - MPEG audio coders - Dolby audio coders - Video compression - Principles - H.261 and MPEG Video.

UNIT V
ERROR CONTROL CODING
9 Hours
Linear Block codes - Syndrome Decoding- Minimum distance consideration - Cyclic codes - Generator Polynomial - Parity check polynomial - Encoder for cyclic codes - Calculation of syndrome - Convolutional Coding - Decoding using Viterbi Algorithm.

FOR FURTHER READING
Case study on Wavelet compression.

Reference(s)
Rafael C.Gonzalez and Richard E.Woods, Digital image processing, PHI, 2013.

Total: 45+30=75 Hours
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td></td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
- Define Entropy, Capacity and information.
- Give the upper bound and lower bound for entropy.
- Define discrete memory less source.
- What is the need for compression techniques?
- Define processing delay and algorithm delay in speech coders.
- Give the error correcting capability of a linear block code.
- Define syndrome in error correcting coding.
- State two properties of syndrome (used in linear block codes).
- What is the significance of a syndrome vector in the context of error control coding?
- Categorize the DCT blocks depending on their derivation.

Understand
- What are the two functional requirements needed in the development of an efficient source encoder?
- What is Lmin? How is it determined?
- What is encoding?
- What is temporal masking and frequency masking?
- What is perceptual coding? Give the advantages of perceptual coding.
- List the advantages of coding speech at low bit rates.
- What is Dolby Ac-1? List the advantages of dolby Ac-1.
- How syndrome is calculated in Hamming codes and cyclic codes?
- Why syndrome decoder is called maximum likelihood decoder?
- I-frames are inserted into the compressed output stream relatively frequently. Justify the same by explaining the terms “Group of pictures (GOP)” and “prediction span”.

Apply
- Calculate entropy H(X) for a discrete memory less source X, which has four symbols X1, X2, X3 & X4 with probabilities P(X1)=0.4, P(X2)=0.3, P(X3)=0.2 and P(X4)=0.1.
- Consider an additive white Gaussian noise channel with 4 KHz bandwidth and noise power spectral density η/2=10-2 w/Hz. The signal power required at the receiver is 0.1 mw. Calculate capacity of this channel.
- Enlighten the principles of LPC. Draw the schematic diagram of an encoder and decoder, and identify and explain the perception parameters and associated vocal tract excitation parameters.
- Briefly describe the procedures followed in dynamic Huffman coding.
- A convolution encoder has a single shift register with 2 stages, 3 modulo-2 adders and an output multiplexer. The generator sequences of the encoder are as follows g1(x)=(101) and g2(x)=(110) and g3(x)=(111). Draw (i) the block diagram of the encoder, (ii) state diagram and also explain the working principle of the encoder.
- Find the channel matrix of the resultant channel. Find P(z1) if P(x1)= 0.6 and P(x2)= 0.
An analog signal having 4 kHz bandwidth is sampled at 1.25 times the Nyquist rate, and each sample is quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.

What is the information rate of this source?
Can the output of this source be transmitted without error over an AWGN channel with a bandwidth of 10 kHz and an S/N ratio of 20 dB?
Find the bandwidth required for an AWGN channel for error-free transmission of the output of this source if the S/N ratio is 25 dB.

Assume a convolution coder. Draw its tree, state and trellis diagrams. Explain Viterbi algorithm taking a suitable example.
Apply Shannon-Fano encoding procedure to the following message symbols \( x = \{ x_1, x_2, x_3, \ldots, x_9 \} \);
\[ P = \{ 0.49, 0.14, 0.14, 0.07, 0.07, 0.04, 0.02, 0.02, 0.01 \} \]

Apply Huffman coding algorithm for data compression. For a DMS ‘X’ with nine symbols \( x_1, x_2, x_3 \ldots x_9 \), Find a compact code for every symbol if the probability distribution is as follows \( P = \{ 0.49, 0.14, 0.14, 0.07, 0.07, 0.04, 0.02, 0.02, 0.01 \} \)
Calculate: i) Entropy of the source ii) Average length of the code
Code Efficiency and iv) Redundancy of the code v) Code variance

Analyse
What is the difference between channel coding and source coding?
Differentiate vocoder and waveform coder?
How dynamic Huffman coding is different than basic Huffman coding?
How CELP provides better quality than LPC in speech coding?
Investigate on the ‘block preparation ‘and quantization phases of JPEG compression process with diagrams wherever necessary.

Evaluate
Construct a convolution encoder for the following specification: Rate efficiency=1/2, constraint length=4. The connection from the shift registers to modulo-2 adders are described by the following equations: \( g_1(x)=1+x \), \( g_2(x)=x \). Determine the output codeword for the input message 1110.
A discrete memory less source has an alphabet of five symbols with there are given by,
\[ [X] = [X_1, X_2, X_3, X_4, X_5] = [0.45, 0.15, 0.15, 0.10, 0.15] \]. Compute Two different codes for the above.
A) The generator matrix for a (6,3) block code is given below. Find all the code word of this code
\[
\begin{align*}
G &= \begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 1 \\
0 & 0 & 1 & 0 & 1 & 1 \\
0 & 1 & 0 & 1 & 1 & 0 \\
0 & 1 & 0 & 1 & 1 & 1 \\
\end{bmatrix}
\end{align*}
\]
B) Consider a (6,3) linear code whose generator matrix
\[
\begin{align*}
G &= \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\
0 & 0 & 1 & 0 & 1 & 1 \\
\end{bmatrix}
\end{align*}
\]
Find all the code vectors.
Find all hamming weights and distances.
(iii)Find minimum weight parity check matrix. (iv)Draw the encoder circuit
Consider a sequence of letters of English alphabet with their probabilities of occurrence as given here:

Letters = \{a, b, c, d, E, f, g, h\}

\([P] = [0.1 \ 0.1 \ 0.2 \ 0.1 \ 0.1 \ 0.2 \ 0.1 \ 0.1]\)

Compute two different Huffman codes for this source. For these two codes:

a. Average code word length
b. Variance of average code word.

Entropy

Draw the macro-block structure of P-frame encoding and explain the encoding procedure.

Create

A black and white television picture may be viewed as consisting of approximately \(2 \times 10^6\) elements, each of which may occupy one of 16 distinct brightness levels with equal probability. Assume that the rate of transmission is 30 picture frames per second. All picture elements are assumed to be independent, and all levels have equally likely occurrence. Calculate the average rate of information conveyed by this TV picture source.

Consider a telegraph source having two symbols, dot and dash. The dot duration is 0.2 s. The dash duration is 3 times the dot duration. The probability of the dot’s occurring is twice that of the dash, and the time between symbols is 0.2 s. Calculate the information rate of the telegraph source.

15IT604 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives

- Synthesize efficient algorithms in common engineering design situations
- Familiarize with major algorithms and data structures
- Analyze worst-case running times of algorithms using asymptotic analysis

Course Outcomes (COs)

- Prove the correctness and analyze the running time of the basic algorithms for classic problems in computational domain
- Apply the algorithms and design techniques to solve problems
- Analyze the complexities of various algorithms in different domains

UNIT I

ALGORITHM ANALYSIS


UNIT II

DIVIDE AND CONQUER


UNIT III

DYNAMIC PROGRAMMING

Dynamic Programming: General Method - Multistage Graphs - All-Pair shortest paths - Optimal binary search trees - 0/1 Knapsack - Traveling salesperson problem searching and sorting algorithms.
UNIT IV
BACKTRACKING

UNIT V
COMPUTATIONAL COMPLEXITY
Computational Complexity: Complexity measures, Polynomial vs non-polynomial time complexity; NP-hard and NP-complete classes, examples. Combinational algorithms, string processing algorithm, Algebraic algorithms, set algorithms.

FOR FURTHER READING
Non deterministic algorithms - Cook’s theorem - Strassen’s matrix multiplication - probabilistic analysis - Amortized analysis.

Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4  4  3</td>
<td>4  3</td>
<td>4  3</td>
<td>4  3</td>
<td>4  3</td>
<td>4  3</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>2  2  5</td>
<td>2  6</td>
<td>2  6</td>
<td>2  6</td>
<td>2  6</td>
<td>2  6</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>2  2  4</td>
<td>2  6</td>
<td>2  6</td>
<td>2  6</td>
<td>2  6</td>
<td>2  6</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>2  2  4</td>
<td>2  6</td>
<td>2  6</td>
<td>2  6</td>
<td>2  6</td>
<td>2  6</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>4  3  6</td>
<td>4  3</td>
<td>4  3</td>
<td>4  3</td>
<td>4  3</td>
<td>4  3</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

Define sub-set sum problem.
What is called divide and conquer strategy?
Define greedy method.
What is called an optimal binary search tree?
Define P class problems.
Discuss the approximation algorithms for NP-hard problems.
Define dynamic programming.
What is memory function?
Define the term backtracking.
Define feasible solution.

Understand

Explain the need of presorting in Element Uniqueness problem.
Exemplify the need of presorting in calculating a mode.
Describe the algorithms for depth-first search of a graph G= (V, E).
Describe the construction sequence of AVL tree with a simple example.
Enumerate the general plan of divide and conquer and explain how the quick sort algorithm works for its average case behaviour.
Illustrate the Sequential search algorithm with its worst-case behaviour.
Exemplify the necessary steps for analyzing efficiency of recursive algorithms with an example.
Explain the various steps involved in algorithmic problem solving.
Compare LIFO and FIFO search.
Classify the three types of time complexity of algorithms.

Apply
1. Construct an AVL tree for the sequence 5,6,8,3,2,4,7.
2. Construct a heap for the list 1,8,6,5,3,7.
3. Sort the numbers 1,8,6,5,3,7 using Merge sort.
4. Construct an AVL tree for the sequence 3,6,5,1,2,4.
5. Construct a heap for the list 5,6,8,3,2,4,7.
6. Construct a binary search tree for the sequence 10,7,12,13,14,20.
7. Design and implement an algorithm for brute force string matching technique.
8. Design a recursive algorithm to compute the factorial function F(n) = n! for an arbitrary non-negative integer n and also derive the recurrence relation.
9. Design and implement a recursive algorithm to solve the Tower of Hanoi Puzzle. Find the time efficiency of this algorithm.
10. Design a nonrecursive algorithm to determine the value of the largest element in a given array and matrix multiplication. Find the time efficiency of those algorithms.

Analyse
Compare backtracking and branch-and-bound.
Analyze the time complexity of sorting algorithms based on divide and conquer technique.
Differentiate deterministic and non-deterministic problems.
Compare DFS and BFS.
Analyze how Brute force design technique is applied to selection sort with an example.
Analyze how decrease-by-one technique is applied to insertion sort with an example.
Find the time complexity of tower of Hanoi puzzle and give a statistics on all cases.

Evaluate
Evaluate the algorithm design technique used in Quick sort with an example.
Evaluate the algorithm design technique used in Merge sort with an example.
Determine an optimal solution to the knapsack instance n = 7, m= 15
(p1, p2, p3, ....p7) = (10, 5, 15, 7, 6, 18, 3) and (w1, w2, w3, ...w7) = (2, 3, 5, 7, 1, 4, 1).

Create
Derive a non-deterministic algorithm to find whether a given graph contains a Hamiltonian cycle.
Derive the recurrence relation for Fibonacci series; perform complexity analysis for the same.

15IT607 DESIGN AND ANALYSIS OF
ALGORITHMS LABORATORY

Course Objectives
Argue the correctness of algorithms using inductive proofs and invariants
Write correctness proofs for algorithms

Course Outcomes (COs)
Demonstrate a familiarity with major algorithms and data structures
Apply important algorithmic design paradigms and methods of analysis
3. Analyze the complexities of various problems in computational domain

**EXPERIMENT 1**
Implement the sorting algorithms and test their correctness and efficiency  

**EXPERIMENT 2**  
Implement Binary Search Trees  

**EXPERIMENT 3**  
Test the efficiency of Minimum Spanning Tree Algorithms  

**EXPERIMENT 4**  
Implement and test Knapsack problem  

**EXPERIMENT 5**  
Implement and analyze the running time of eight-queens problem using backtracking  

**EXPERIMENT 6**  
Implement Travelling Sales Person problem using backtracking and Genetic Algorithm and analyze the implementation complexities  

**EXPERIMENT 7**  
Implementing selection sort using brute-force method  

**Total: 30 Hours**
EXPERIMENT 4
Implementation of Data classification Algorithms
4 Hours

EXPERIMENT 5
Implementation of Data Clustering Algorithms
4 Hours

EXPERIMENT 6
Implementation of Web Mining Algorithms
4 Hours

EXPERIMENT 7
Implementation of Text Mining Algorithms
6 Hours

Total: 30 Hours

15IT609 TECHNICAL SEMINAR II

Course Objectives
To develop the self-learning skills to utilize various technical resources available from multiple field.
To promote the technical presentation and communication skills.
To impart the knowledge on intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.

Course Outcomes (COs)
Refer and utilize various technical resources available from multiple field.
Improve the technical presentation and communication skills.
Understand the importance of intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
Interact and share their technical knowledge to enhance the leadership skills.
Understand and adhere to deadlines and commitment to complete the assignments.

15IT610 MINI PROJECT IV

Course Objectives
To develop knowledge to formulate a real world problem and project's goals.
To identify the various tasks of the project to determine standard procedures.
To identify and learn new tools, algorithms and techniques.
To understand the various procedures for validation of the product and analysis the cost effectiveness.
To understand the guideline to Prepare report for oral demonstrations.

Course Outcomes (COs)
Formulate a real world problem, identify the requirement and develop the design solutions.
Express the technical ideas, strategies and methodologies.
Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.  
Test and validate through conformance of the developed prototype and analysis the cost effectiveness.  
Prepare report and present the oral demonstrations.

**15GE611 LIFE SKILLS: APTITUDE II**

**Course Objectives**
The undergraduate students to such methods and practices that help, develop and nurture qualities such as character, effective communication, aptitude and holding ethical values.

**Course Outcomes (COs)**
- Perform arithmetical operations with complex numbers
- Explain the meanings of a relation defined on a set, an equivalent relation and a partition of a set
- Calculate percentages in real life contexts, find any percentage of a given whole using their knowledge of fraction multiplication and increase / decrease a given whole by a percentage
- Calculate the Ratio, Proportions and Variation
- Identify the percentage gain or percentage loss
- Differentiate Pipes and Cisterns
- Demonstrate the situations like motion in as straight line, Boats and Streams, Trains, Races and clocks
- Evaluate the Counting techniques, Permutation and Combination, Recursion and generating functions
- Categorize the distributions of probability with respect to the random variables
- Discuss the different cases of Mixtures and Alligation

**NUMBER SYSTEMS**
Introduction - definition - classification on Numbers - power cycles and remainders - short cut process concept of highest common factor - concept of least common multiple - divisibility - number of zeros in an expression

**PERCENTAGES**
Introduction - definition and Utility of percentage - importance of base/denominator for percentage calculations - concept of percentage values through additions - fraction to percentage conversion table

**AVERAGES**
Introduction - average of different groups - addition or removal of items and change in average - replacement of some of the items

**RATIO, PROPORTIONS AND VARIATION**
Introduction - Ratio - properties - dividing a given number in the given ratio - comparison of ratios - proportions - useful results on proportion - continued proportion - relation among the quantities more than two - variation
PROFIT AND LOSS
Gain/Loss and percentage gain or percentage loss-multiplying equivalents to find sale price - relation among cost price, sale price, gain/loss and percentage gain or percentage loss - an article sold at two different selling price - two different articles sold at same selling price - percentage gain or percentage loss on selling price - percentage gain or percentage loss on whole property

3 Hours

TIME AND WORK
Introduction - Basic concepts -Concepts on working with different efficiency - Pipes and Cisterns - Work Equivalence (Man Days) -Alternative approach

TIME, SPEED AND DISTANCE
Definition - Basics of Time, Speed and Distance - Relative speed - Problems based on Trains? Problems based on Boats and Streams -Problems based on Races - time taken with two difference modes of transport - time and distance between two moving bodies

3 Hours

PERMUTATION AND COMBINATION
Definition - Fundamental rules - Theorems on Permutation - Theorems on Combination

3 Hours

PROBABILITY
Concept and importance of probability - underlying factors for Real- Life estimation of probability - Basic facts about probability - some important consideration while defining event.

3 Hours

MIXTURES AND ALLIGATION
Definition - alligation rule - mean value (cost price) of the mixture - some typical situations where allegation can be used.

3 Hours

Total: 30 Hours

Reference(s)

Course Objectives
To understand Human values, ethical theory, codes of ethics, work place responsibilities, rights, engineering experimentation, global issues and contemporary ethical issues
To understand personal ethics, legal ethics, cultural associated ethics and engineer’s responsibility
Course Outcomes (COs)

Articulate engineering ethics theory with sustained lifelong learning to strengthen autonomous engineering decisions

Be an example of faith, character and high professional ethics, and cherish the workplace responsibilities, rights of others, public’s welfare, health and safety

Contribute to shape a better world by taking responsible and ethical actions to improve the environment and the lives of world community

Fortify the competency with facts and evidences to responsibly confront moral issues raised by technological activities, and serve in responsible positions of leadership

5. Be Proficient in analytical abilities for moral problem solving in engineering situations through exploration and assessment of ethical problems supported by established experiments

UNIT I

HUMAN VALUES

UNIT II

ENGINEERING ETHICS AND PROFESSIONALISM

UNIT III

ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as EXPERIMENTation - Engineers as responsible EXPERIMENTers - Balanced outlook on law - Cautious optimism - Safety and risk - Assessing and reducing risk - Safe exits - The Challenger case study - Bhopal Gas Tragedy - The Three Mile Island and Chernobyl.

UNIT IV

WORKPLACE RESPONSIBILITIES AND RIGHTS

UNIT V

GLOBAL ISSUES
Multinational corporations: Technology transfer and appropriate technology - International rights - promoting morally just measures - Environmental ethics: Engineering, ecology - economics - Human and sentient centred - and bio and eco centric ethics - Computer ethics and internet - Engineers as managers - Consulting engineers - Engineers as expert witnesses and advisors - Moral leadership.

FOR FURTHER READING
The Challenger case study - Bhopal Gas Tragedy - The Three Mile Island and Chernobyl case studies - Fundamental Rights, Responsibilities and Duties of Indian Citizens - Sample code of ethics like
IETE, ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management.

Total: 30 Hours

Reference(s)
R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited, New Delhi,2006.

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5 5 5 5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>5 5 5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>5 5 10</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>5 5 5 5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>5 5 5 5</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
Define Human Values.
What are Morals and Values?
What do you mean by Civic virtue and Respect for others?
Write the various meanings of Spirituality?
List four different types of Virtues.
Mention different Human values.
What is meant by moral autonomy?
Classify the types of inquiry
What are the steps needed in confronting moral dilemmas?
List the levels of moral development suggested by Kohlberg
What do you understand by self-interest and ethical egoism?
What are the steps needed in confronting moral dilemmas?
What are the three virtues of religion?
What are the professional responsibilities?

Which are the practical skills that will help to produce effective independent thought about moral issues?
Why does engineering have to be viewed as an EXPERIMENTal process?
Why isn’t engineering possible to follow a random selection in product design?
Why is the code of ethics important for engineers in their profession?
What does the Balanced Outlook on Law stress in directing engineering practice?
Are the engineers responsible to educate the public for safe operation of the equipment?
How?
What kind of responsibility should the engineer have to avoid mistakes that may lead to accident due to the design of their product?

What is the use of knowledge of risk acceptance to engineers?

Why is Environmental Ethics so important to create environmental awareness to the general public?

Why do the engineers refuse to do war works sometimes?

Apply

How does the consideration of engineering as a social EXPERIMENTation help to keep a sense of autonomous participation is a person’s work?

How does the code of ethics provide discipline among the engineers?

Exemplify the space shuttle Challenger case accident?

How does the manufacturer understand the risk in a product catalog or manual?

How does the knowledge of uncertainties in design help the engineers to access the risk of a product?

How can the quantifiable losses in social welfare resulting from a fatality be estimated? Give some examples.

How does the engineer act to safeguard the public from risk?

15IT702 GRAPHICS AND MULTIMEDIA

Course Objectives

Provide in-depth knowledge of display systems, image synthesis and shapes
Understand basic concepts related to Multimedia including data standards, algorithms and software
Develop multimedia applications by utilizing existing libraries

Course Outcomes (COs)

Apply 2D graphics and algorithms to real world applications
Create interactive graphics applications using 3D modelling and transformation techniques
Understand the processes involved in the development of a multimedia product from client brief through to delivery
Plan and create a multimedia product that includes animation, audio and video

UNIT I

GRAPHICS FUNDAMENTALS

UNIT II

TWO DIMENSIONAL GRAPHICS
Two dimensional geometric transformations - Matrix representations and homogeneous coordinates, composite transformations: windowto-viewport coordinate transformation, Two dimensional viewing functions: clipping operations-Point Clipping - Line Clipping: Cohen Sutherland, Liang Barsky - Polygon Clipping: Sutherland Hodgeman.

UNIT III

THREE DIMENSIONAL GRAPHICS
Three dimensional concepts: Three dimensional object representations - Polygon surfaces - Polygon tables - Plane equations - Polygon meshes: Curved Lines and surfaces, Quadric surfaces: Blobby objects Spline representations - Bezier curves and surfaces - B-Spline curves and surfaces.
UNIT IV
ANIMATION

UNIT V
MULTIMEDIA
Basic software tools - Text, image, and sound editing tools - painting and drawing tools, animation tools - making instant multimedia - Office suite - Multimedia authoring tools : Types, card and page based authoring tools, icon and time based authoring tools.

FOR FURTHER READING
Multimedia systems and Applications - Multimedia communication systems - Databases - Synchronization issues - Presentation requirements - Video conferencing - Virtual reality - Interactive video.

Total: 45 Hours

Reference(s)
Prabhat K Andleigh and Kiran Thakrar, Multimedia systems design, PHI, 2011.

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F 4 C 4 P 4 M 2 6</td>
<td>F 2 C 6 P 2 M 2</td>
<td>F 4 C 4 P 4 M 4</td>
<td>F 8 C 2 P 4 M 2</td>
<td>F 4 C 4 P 4 M 4</td>
<td>F 4 C 4 P 4 M 4</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>F 2 C 2 P 2 M 2</td>
<td>F 2 C 6 P 2 M 2</td>
<td>F 4 C 2 P 4 M 4</td>
<td>F 8 C 2 P 4 M 2</td>
<td>F 4 C 2 P 4 M 4</td>
<td>F 4 C 2 P 4 M 4</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>F 2 C 2 P 2 M 2</td>
<td>F 2 C 4 P 2 M 4</td>
<td>F 2 C 6 P 2 M 4</td>
<td>F 8 C 2 P 4 M 4</td>
<td>F 4 C 2 P 4 M 4</td>
<td>F 4 C 2 P 4 M 4</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>F 2 C 2 P 2 M 2</td>
<td>F 2 C 4 P 2 M 4</td>
<td>F 2 C 6 P 2 M 4</td>
<td>F 8 C 2 P 4 M 4</td>
<td>F 4 C 2 P 4 M 4</td>
<td>F 4 C 2 P 4 M 4</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>F 2 C 2 P 2 M 2</td>
<td>F 2 C 4 P 2 M 4</td>
<td>F 2 C 6 P 2 M 4</td>
<td>F 8 C 2 P 4 M 4</td>
<td>F 4 C 2 P 4 M 4</td>
<td>F 4 C 2 P 4 M 4</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
List the three Graphics Software Standards.
What is the Cartesian slope-intercept equation for a straight line?
Give the Equation for window port to viewport transformation?
Mention any five applications of computer graphics in industry.
Which is the simplest output primitive?
Name some of the graphics standards.
A straight line segment is translated by applying which transformation equation?
List any three Two dimensional viewing functions with correct syntax?
List the types of database replication?
List out the building blocks of multimedia

Understand
Explain the working principle of CRT.
Summarize the steps followed in DDA line drawing algorithm.
Draw the block diagram of pipeline transforming a view of world coordinate scene to device coordinate.
Compare parallel projection with perspective projection and derive their projection matrices. State the advantages of B spline curve over Beizer curve for generating curve. Exemplify bezier curve with their properties. Classify the two types of chunks specified by the MIDI format. Compare and contrast hyper media and hyper text. Describe the different aspects of integrated multimedia standards. What are the services provided by the directory service agent?

**Apply**
- Why Octant symmetry property cannot be applied in Ellipse drawing process?
- Explain the Octant symmetry property. How it is applied in drawing a circle?
- Design a block diagram of a pipeline for transforming a view of world coordinate scene to device coordinate.
- Assess why Quadratic surfaces are frequently used?
- Demonstrate packet loss in multimedia communication.
- Assess the main functions of a Multimedia development system.
- Demonstrate the need of optical storage media with suitable reasons.
- Assess the design issues for multimedia authoring.
- Demonstrate oblique and orthogonal projections.
- Apply Bresenham's line drawing algorithm and plot the points of a line going from (20,10) to (30,18).

**Analyze**
- Differentiate between the Random scan and Raster Scan display.
- Compare DDA Line Algorithm with Bresenham's line algorithm.
- Mention the disadvantage of line DDA.
- Differentiate oblique and orthogonal projections.
- Differentiate between interpolation spline and approximation spline.
- Differentiate bezier curves and B-spline curves.
- Assess the efficiency of B spline curve over beizer for generating curve.

**Evaluate**
- If a point \((x,y)\) is reflected about an axis which is normal to the XY plane and passing through the origin, the reflected point \((X, Y)\) is: a) \((x, -y)\) b) \((-x, y)\) c) \((-x, -y)\) d) \((y, x)\). Why Octant symmetry property cannot be applied in Ellipse drawing process?
- How the 1st Quadrant in Ellipse is drawn using the Mid-Point ellipse Algorithm?

**Create**
- List the steps to Perform image editing using basic tool, masking effect and rendering effects using Photoshop.
- Explain the Mid point algorithm to generate the ellipse. Take the data Radius-x = 8 and Radius-Y = 6 and plot all the points of a ellipse in the first Quadrant.

---

**Course Objectives**
- Learn the XML Technologies and modeling databases in XML
- Provide an overview of Service Oriented Architecture and the importance of Web services

**Course Outcomes (COs)**
1. Impart knowledge in XML technologies to build robust XML applications
Familiarize with concepts of SOA, standards and technologies for building the Web Services
Use the approaches for providing security for XML documents and the messages exchanged among Web Services

UNIT I
XML TECHNOLOGY

UNIT II
SOA BASICS
Service Oriented Architecture (SOA) - Comparing SOA with Client-Server and Distributed architectures - Characteristics of SOA - Benefits of SOA - Principles of Service orientation - Service layers - Business Process management.

UNIT III
ARCHITECTING WEB SERVICES

UNIT IV
WEB SERVICES BUILDING BLOCKS

UNIT V
XML AND WEB SERVICES SECURITY

FOR FURTHER READING
RDF - Semantic Web - Case study: Success with SOA and Web services.

Total: 45 Hours

Reference(s)
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember F</th>
<th>Understand F</th>
<th>Apply F</th>
<th>Analyse F</th>
<th>Evaluate F</th>
<th>Create F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>4 6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>4 4</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

**Remember**
- Define XML.
- State the role of XML in web application.
- Does SOAP Require the Web and Network?
- Recognize when SOAP faults will occur.
- List the limitations of CORBA and DCOM.
- Name the major aspects of Web service technologies.
- List the WDSL extensibility elements documents.
- Define SMIL modularization.
- State canonicalization.
- List the guidelines for signing XML documents.

**Understand**
- Classify the 3 different XML revolutions.
- Identify the Transformation techniques.
- Illustrate the concept of SOAP fault.
- Summarize SOAP characteristics.
- Explain the two steps to invoking a Web Service.
- Interpret the concept of using Quality of Service and Reliable Messaging in SOA.
- Explain the technical architecture of ebXML.
- Represent the organization of UDDI.
- Explain the applications of XML as occurring in three waves.
- Compare the three basic security requirements for e-business and explain.

**Apply**
1. Write a CSS that makes all text three times larger than the base font and the font color is red.
2. Demonstrate the procedure to create an external DTD with an example.
3. Predict the reason why SOAP is important?
4. Write the SOAP Encoding techniques.
5. Implement the architectural view of web services technology stack with block diagram.
6. What is mean by B2B & B2C and explain the business and technical motivations for web services with detail.
7. Illustrate the types of XML signatures and cannibalization.
8. Write a DTD for mark statement of a student.
9. Show a simple code snippet to encrypt XML.
10. Implement XML digital signature.

**Analyse**
- Differentiate DTD and XML Schema.
- Compare SOAP and IIOP.
- Integrate web service creation with database connectivity.
- Organize a web service for adding few numbers using Net Beans and write client side code to invoke the web service.
- Determine the concept of XACML used in XML security.
Create a SOA project with XSLT Module to compose a web service.
Justify XML messages are packaged and enveloped in a web service.
Discriminate the overview of SOAP Communication.
Determine the various web services that are used.

Evaluate
Write an XSLT program to extract book titles, authors, publications, book rating from the books XML document and use formatting.

Create
Develop a XML document using elements, attributes and CDATA section.
Create an application to implement the Library Management System using HTML and XML.

15IT704 INFORMATION SECURITY 3 0 0 3

Course Objectives
Understand how information security is practiced in computing systems
Learn cryptographic techniques for secure data transfer and authentication
Familiarize with the implementation of security policies and protocols

Course Outcomes (COs)
Analyze and evaluate various cryptographic algorithms
Design a secure system by following basic principles and appropriate techniques
Apply ethical principles and commit to professional ethics and norms of the engineering practice

UNIT I
SYMMETRIC CRYPTOGRAPHY

UNIT II
ASYMMETRIC CRYPTOGRAPHY

UNIT III
MESSAGE AUTHENTICATION AND HASH FUNCTIONS

UNIT IV
SECURITY AT LAYERS (NETWORK, TRANSPORT, APPLICATION)
IPSec - Secure Socket Layer (SSL) - Transport Layer Security(TLS) - Secure Electronic Transaction(SET) - Pretty Good Privacy(PGP) - S/MIME - Firewall design principles - Types of firewalls.

UNIT V
LAWS, INVESTIGATION AND ETHICS
FOR FURTHER READING
Case study on Wired/Wireless Encryption Privacy.

Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
Define information security.
List the critical characteristics of information.
List and explain the various components of an information system.
What is the difference between attack and vulnerability? List and explain any seven attacks.
List and describe the credentials of the various information security certifications.
What are the threats to information security?
What are the multiple layers of security?
What are the types of information security policies?
What are the credentials of information security professionals?
What are the characteristics of CIA triangle?

Understand
Why is information security a management problem?
When can a computer be an object and subject to an attack respectively?
Explain the four important functions of information security in an organization?
Explain the ethical concepts in information security?
Explain the major types of attacks in detail.
Explain the security system development life cycle in detail.
Discuss the ethical concepts in information security and the prevention to illegal and unethical behaviour.

Describe the process of risk identification in detail.

Describe the commonly accepted information security Principles?

Explain the types of Attacks in detail?

Explain the Cryptographic algorithms in detail.

Apply

If you had to both encrypt and compress data during transmission, which would you do first, and why?

In public-key cryptography you have a public and a private key, and you often perform both encryption and signing functions. Which key is used for which function?

What are your first three steps when securing a Linux server?

What are your first three steps when securing a Windows server?

Who’s more dangerous to an organization, insiders or outsiders? Justify your answer.

Cryptographically speaking, what is the main method of building a shared secret over a public medium? Defend your answer.

How would you implement a secure login field on a high traffic website where performance is a consideration?

If you were a site administrator looking for incoming CSRF attacks, what would you look for?

What do you think the primary reason most companies haven’t fixed their vulnerabilities?

What is SSL and why is it not enough when it comes to encryption?

Analyse

Distinguish between symmetric and asymmetric encryption.

Distinguish between DoS and DDoS.

Differentiate Direct and Indirect attacks.

Differentiate Private & Public Laws.

Differentiate Preventive and Detective control.

Compare and contrast the protocols used in Secure Internet Communication?

Distinguish between PKI and Hash Function.

Differentiate between Digital Signatures and Pretty Good Privacy.

What’s the difference between HTTP and HTML?

What’s the difference between Diffie-Hellman and RSA?

What are Linux’s strengths and weaknesses vs. Windows?

Create

Deliberate acts of Sabotage or vandalism.

Deliberate the acts of human error or failure.

15IT707 GRAPHICS AND MULTIMEDIA
LABORATORY

Course Objectives

Introduced to computer graphics techniques focusing on 3D modeling, image synthesis and rendering

Understand and demonstrate computer graphics animation

Use basic multimedia software tools.

Course Outcomes (COs)

Create Interactive graphics applications using one or more graphics application programming interfaces

Write Programs that demonstrates geometrical transformations
3. Design a basic Multimedia system using sound and video

**EXPERIMENT 1**
Implementation of Line Drawing Using DDA Algorithm and Bresenham Algorithm

**EXPERIMENT 2**
Implementation of Circle Drawing using Midpoint Algorithm and Bresenham Algorithm

**EXPERIMENT 3**
Implementation of Ellipse Drawing

**EXPERIMENT 4**
Implementation of Basic 2D Transformations like Scaling, Rotation, Translation and Reflection

**EXPERIMENT 5**
Implementation of 3D Transformations

**EXPERIMENT 6**
Implementation of Cohen Sutherland Line Clipping Algorithm

**EXPERIMENT 7**
To Animate a Tyre running in a straight path.

**EXPERIMENT 8**
To animate flying Indian National Flag.

**EXPERIMENT 9**
To perform a morphing effect of crying face to sad face to happy face and last to most happiest face.

**EXPERIMENT 10**
Edit a Photo by applying various effects. Use Adobe Photoshop.

**Total: 30 Hours**

**15IT708 XML AND WEB SERVICES LABORATORY**

**Course Objectives**
- Provide the technologies for building and modeling XML documents
- Build web services using JAX RPC and WS

**Course Outcomes (COs)**
- Create XML document structure for storing and Transporting data
- Use DTD, XSD and XSL to validate and model the XML document structure
- Develop web services with SOA design principles

**EXPERIMENT 1**
XML document creation
EXPERIMENT 2
Importing and Exporting XML document in database

EXPERIMENT 3
Create an XML document and validate it using XML schema to store library book details and create the DTD files.

EXPERIMENT 4
Validating XML with Internal and External DTD

EXPERIMENT 5
Rendering XML with XML Schema

EXPERIMENT 6
Parsing XML document using DOM/SAX parser

EXPERIMENT 7
Web Service creation using JAX-WS

EXPERIMENT 8
Building Web Services with JAX-RPC

Total: 30 Hours

15IT709 MINI PROJECT V

Course Objectives
To develop knowledge to formulate a real world problem and project's goals.
To identify the various tasks of the project to determine standard procedures.
To identify and learn new tools, algorithms and techniques.
To understand the various procedures for validation of the product and analysis the cost effectiveness.
To understand the guideline to Prepare report for oral demonstrations.

Course Outcomes (COs)
Formulate a real world problem, identify the requirement and develop the design solutions.
Express the technical ideas, strategies and methodologies.
Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
Prepare report and present the oral demonstrations.

15GE710 LIFE SKILLS : COMPETITIVE EXAMS

Course Objectives
Understand the concepts of data structures, algorithms and computer architecture.
Understand the OS and design of compilers.
Familiar with the database and network concepts.

Course Outcomes (COs)
Explore the concepts of data structures, algorithms and computer architecture.
Elucidate the concepts of operating systems and designing compilers.
Explain the concepts of networks and manage databases.

10 Hours

UNIT I
Data structures and algorithms
Introduction - Linear data structures - Non linear data structures - Asymptotic Notation - Space and Time complexity - Greedy approach - Dynamic Programming - Divide and conquer - Hashing

10 Hours

UNIT II
Operating System: Processes - Threads - Deadlock - CPU scheduling - Memory management and virtual memory.

10 Hours

UNIT III
Database Management System: File systems - ER-model - Relational model (relational algebra, tuple calculus) - Database design (integrity constraints, normal forms) - Query languages (SQL) - File structures - Transactions and concurrency control.

Total: 30 Hours

Reference(s)

Course Objectives
To develop knowledge to formulate a real world problem and project's goals.
To identify the various tasks of the project to determine standard procedures.
To identify and learn new tools, algorithms and techniques.
To understand the various procedures for validation of the product and analysis the cost effectiveness.
To understand the guideline to Prepare report for oral demonstrations.

**Course Outcomes (COs)**

- Formulate a real world problem, identify the requirement and develop the design solutions.
- Express the technical ideas, strategies and methodologies.
- Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
- Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
- Prepare report and present the oral demonstrations.

### ELECTIVES

**LANGUAGE ELECTIVES**

**15LE101 BASIC ENGLISH I**

3 0 0 3

**Course Objectives (COs):**

- To offer students the basics of the English Language in a graded manner.
- To promote efficiency in English Language by offering extensive opportunities for the development of all the four language skills (LSRW) within the classroom.
- To focus on improving and increasing vocabulary.
- To improve spelling and pronunciation by offering students rigorous practice and exercises.

**Course Outcome (CO):**

The students will be able to

Converse in English with more confidence.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Vocabulary/ Grammar</th>
<th>Skills Sets</th>
<th>Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic words- 12 most used words in English, usage and pronunciation</td>
<td>Starting a conversation and talking about what one does</td>
<td>Sentence construction bolstered by mother tongue</td>
</tr>
<tr>
<td>2</td>
<td>Basic words- 20 often used words, usage and pronunciation</td>
<td>Analysing an action plan</td>
<td>Creating and presenting one’s own action plan</td>
</tr>
<tr>
<td>3</td>
<td>Basic words with a focus on spelling</td>
<td>Discriminative listening</td>
<td>Informal conversation</td>
</tr>
<tr>
<td>4</td>
<td>Basic words- 10 oft used words, usage and pronunciation</td>
<td>Content listening and Intonation</td>
<td>Reading comprehension</td>
</tr>
<tr>
<td>5</td>
<td>Unit Test I</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Unit II

<table>
<thead>
<tr>
<th>Module</th>
<th>Vocabulary/ Grammar</th>
<th>Skills Sets</th>
<th>Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic words + greetings to be used at different times of the day</td>
<td>Formal conversation</td>
<td>Intonation to be used in formal address</td>
<td></td>
</tr>
<tr>
<td>Last 28 of the 100 most used words</td>
<td>Informal conversation between equals</td>
<td>Reading practice and peer learning</td>
<td></td>
</tr>
<tr>
<td>Using the 14 target words to form bigger words</td>
<td>Informal dialogues using contracted forms</td>
<td>Guided speaking - talking to peers using contracted forms</td>
<td></td>
</tr>
<tr>
<td>Palindromes, greetings - good luck, festivals</td>
<td>Placing a word within its context - culling out meaning</td>
<td>Offering congratulations</td>
<td></td>
</tr>
</tbody>
</table>

10 Unit Test II

### Unit III

<table>
<thead>
<tr>
<th>Module</th>
<th>Vocabulary/ Grammar</th>
<th>Skills Sets</th>
<th>Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homophones</td>
<td>Formal and informal methods of self-introduction</td>
<td>Let’s Talk is a group activity that gives them some important pointers of speech</td>
<td></td>
</tr>
<tr>
<td>Homophone partners, matching words with their meanings</td>
<td>Contracted forms of the –be verbs, ‘ve and ‘s</td>
<td>Translating English sentences to Tamil</td>
<td></td>
</tr>
<tr>
<td>Briefcase words- finding smaller words from a big word</td>
<td>Formal and informal ways of introducing others</td>
<td>Team work - speaking activity involving group work, soft skills</td>
<td></td>
</tr>
<tr>
<td>Compound words and pronunciation pointers</td>
<td>Giving personal details about oneself</td>
<td>Using the lexicon</td>
<td></td>
</tr>
</tbody>
</table>

10 Unit Test III

### Unit IV

<table>
<thead>
<tr>
<th>Module</th>
<th>Vocabulary/ Grammar</th>
<th>Skills Sets</th>
<th>Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper and common nouns</td>
<td>Asking for personal information and details</td>
<td>Pronunciation pointers - an informal introduction to the IPA</td>
<td></td>
</tr>
<tr>
<td>Pronouns</td>
<td>Telephone skills and etiquette</td>
<td>Reading aloud and comprehension</td>
<td></td>
</tr>
<tr>
<td>Abstract and common nouns</td>
<td>Dealing with a wrong number</td>
<td>Reading practice and comprehension</td>
<td></td>
</tr>
<tr>
<td>Group names of animals, adjectives</td>
<td>Taking and leaving messages on the telephone</td>
<td>Pronunciation pointers</td>
<td></td>
</tr>
</tbody>
</table>

10 Unit Test IV
### Unit V

<table>
<thead>
<tr>
<th>Module</th>
<th>Vocabulary/ Grammar</th>
<th>Skills Sets</th>
<th>Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Determiners</td>
<td>Interrupting a conversation politely-formal and informal</td>
<td>Pair work reading comprehension</td>
</tr>
<tr>
<td>22</td>
<td>Conjugation of the verb ‘to be’- positive and negative forms</td>
<td>Thanking and responding to thanks</td>
<td>Comprehension questions that test scanning, skimming and deep reading</td>
</tr>
<tr>
<td>23</td>
<td>Am/is/are questions</td>
<td>Giving instructions and seeking clarifications</td>
<td>Small group activity that develops dialogue writing</td>
</tr>
<tr>
<td>24</td>
<td>Present continuous tense-form and usage</td>
<td>Making inquiries on the telephone</td>
<td>Finishing sentences with appropriate verbs</td>
</tr>
<tr>
<td>25</td>
<td>Unit Test V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Unit VI

<table>
<thead>
<tr>
<th>Module</th>
<th>Vocabulary/ Grammar</th>
<th>Skills Sets</th>
<th>Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Words with silent ‘b’ Present continuous questions</td>
<td>Calling for help in an emergency</td>
<td>Dialogue writing</td>
</tr>
<tr>
<td>27</td>
<td>Words with silent ‘c’ Simple present tense-form and usage</td>
<td>Making requests and responding to them politely</td>
<td>Identifying elements of grammar in text extract</td>
</tr>
<tr>
<td>28</td>
<td>Simple present tense-rules</td>
<td>Describing people</td>
<td>Guided writing</td>
</tr>
<tr>
<td>29</td>
<td>Words with silent ‘g’ Questions in the simple present tense</td>
<td>Describing places</td>
<td>Filling in the blanks with correct markers of tense</td>
</tr>
<tr>
<td>30</td>
<td>Unit Test VI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total: 45 Hours**

**Reference(s)**

**Course Objectives**
- To acquire effective listening and reading skills
- To develop speaking and writing skills
- To improve their understanding of grammar, vocabulary and pronunciation

**Course Outcomes (COs)**
1. Develop their fluency and language competency in English
UNIT I
GRAMMAR
Content words - Structural words - Subject - Verbs and verb phrase - Subject - Verb agreement - Tenses - Active voice and passive voice - Sentence types (declarative, imperative, exclamatory & interrogative) - Framing questions - Comparative adjective

UNIT II
LISTENING
Listening for specific information: Short conversations / monologues - Gap filling - Telephone conversations - Note-taking - Listening for gist / interviews - Listening to songs and completing the lyrics - Clear individual sounds - Word stress - Telephone etiquette

UNIT III
READING
Prediction - Skimming for gist - Scanning for specific information - Understanding text and sentence structure

UNIT IV
WRITING
Short documents: E-mail - memo - note - message - notice - advertisement - Short reports / proposals - Principles of writing a good paragraph: Unity, cohesion and coherence - Identifying the topic sentence and controlling ideas - Paragraph writing (descriptive, narrative, expository & persuasive)

UNIT V
SPEAKING
Self-introduction - Giving personal and factual information - Talking about present circumstances, past experiences and future plans - Mini-presentation - Expressing opinions and justifying opinions - Agreement / disagreement - Likes and dislikes - Speculation - Tongue twisters

FOR FURTHER READING
Novel Reading - Book Review

Total: 45 Hours

Reference(s)

15LE201 BASIC ENGLISH II

Course Objectives (COs):
To give room for a natural acquisition of Basic English Grammar through ample listening, reading and writing inputs
To specifically focus on speaking and conversation skills with an aim to increase speaking ability
To improve Spelling and Pronunciation by offering rigorous practice and exercises
Course Outcome (CO):
Communicate better with improved fluency, vocabulary and pronunciation.

<table>
<thead>
<tr>
<th>Unit I</th>
<th>Vocabulary/ Grammar</th>
<th>Skills Sets</th>
<th>Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>Difference between Present Continuous and Simple Present tense.</td>
<td>Calling for help in an emergency</td>
<td>Reporting an event-journalistic style</td>
</tr>
<tr>
<td></td>
<td>Verbs ‘have’ and ‘have got’ Simple Past Tense</td>
<td>Describing animals</td>
<td>Asking for and giving directions</td>
</tr>
<tr>
<td></td>
<td>Spelling rules &amp; table of Irregular Verbs</td>
<td>Inviting people, accepting and declining invitations</td>
<td>Self-enquiry and offering one’s opinion on a given topic.</td>
</tr>
<tr>
<td>Unit II</td>
<td>Vocabulary/ Grammar</td>
<td>Skills Sets</td>
<td>Skill Sets</td>
</tr>
<tr>
<td>36</td>
<td>Questions and the negative form of the simple past tense</td>
<td>Apologizing and responding to an apology</td>
<td>(Reading) conversation practice</td>
</tr>
<tr>
<td>37</td>
<td>Asking questions in the simple past tense</td>
<td>Reading comprehension</td>
<td>Seeking, granting and refusing permission</td>
</tr>
<tr>
<td>38</td>
<td>Past continuous tense</td>
<td>Paying compliments and responding to them</td>
<td>Pair work: writing dialogues and presenting them</td>
</tr>
<tr>
<td>39</td>
<td>Difference between simple past and past continuous- when and where to use each</td>
<td>Describing daily routines</td>
<td>Reading and comprehension skills</td>
</tr>
<tr>
<td>40</td>
<td>Unit Test I</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit III</th>
<th>Vocabulary/ Grammar</th>
<th>Skills Sets</th>
<th>Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Simple future tense</td>
<td>Talking about the weather</td>
<td>Making plans- applying grammar theory to written work</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>42</td>
<td>Simple future tense- more aspects, possessive pronouns</td>
<td>Talking about possessions</td>
<td>Opening up and expressing one’s emotions</td>
</tr>
<tr>
<td>43</td>
<td>Future continuous tense</td>
<td>Talking about current activities</td>
<td>Listening comprehension</td>
</tr>
<tr>
<td>44</td>
<td>Revision of future tense- simple and continuous forms, prepositions used with time and date</td>
<td>Asking for the time and date</td>
<td>Discussion- analyzing and debating a given topic</td>
</tr>
<tr>
<td>45</td>
<td>Unit Test III</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Unit IV**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Module</td>
<td>Vocabulary/ Grammar</td>
<td>Skills Sets</td>
<td>Skill Sets</td>
</tr>
<tr>
<td>46</td>
<td>Articles a/an</td>
<td>Writing, speaking and presentation skills</td>
<td>Transcribing dictation</td>
</tr>
<tr>
<td>47</td>
<td>Singular- Plural (usage of a/an)</td>
<td>Reading practice-independent and shared reading</td>
<td>Comprehension- logical analysis, process analysis and subjective expression</td>
</tr>
<tr>
<td>48</td>
<td>Countable and uncountable nouns- a/an and some</td>
<td>Listening comprehension</td>
<td>Vocabulary: using context tools to decipher meaning</td>
</tr>
<tr>
<td>49</td>
<td>Articles- the</td>
<td>Sequencing sentences in a paragraph</td>
<td>Listening to a poem being recited, answer questions on it and practice reciting the same</td>
</tr>
<tr>
<td>50</td>
<td>Unit Test IV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Unit V**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Module</td>
<td>Vocabulary/ Grammar</td>
<td>Skills Sets</td>
<td>Skill Sets</td>
</tr>
<tr>
<td>51</td>
<td>Articles- the: usage and avoidance</td>
<td>Speaking: sharing stories about family, village/town, childhood, etc. 10 students</td>
<td>Listening: comprehend and follow multiple step instructions read out by the teacher</td>
</tr>
<tr>
<td>52</td>
<td>Articles- the: usage and avoidance with like and hate</td>
<td>Speaking: sharing stories about family, village/town, childhood, etc. 10 students</td>
<td>Reading: make inferences from the story about the plot, setting and characters</td>
</tr>
<tr>
<td>53</td>
<td>Articles- the: usage and avoidance with names of places</td>
<td>Speaking: sharing stories about family, village/town, childhood, etc. 10</td>
<td>Comprehension passage</td>
</tr>
</tbody>
</table>
Unit VI

<table>
<thead>
<tr>
<th>Module</th>
<th>Vocabulary/ Grammar</th>
<th>Skills Sets</th>
<th>Skill Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>One and ones</td>
<td>Collaborative learning- problem solving</td>
<td>Writing short answers to questions based on reading</td>
</tr>
<tr>
<td>57</td>
<td>Capitalization and punctuation</td>
<td>Controlled writing</td>
<td>Listen to a story and respond to its main elements</td>
</tr>
<tr>
<td>58</td>
<td>Syntax and sentence construction- rearrange jumbled sentences</td>
<td>Guided writing</td>
<td>Listen to a poem and discuss its elements</td>
</tr>
<tr>
<td>59</td>
<td>Cloze</td>
<td>Free writing</td>
<td>Frame simple yet purposeful questions about a given passage</td>
</tr>
<tr>
<td>60</td>
<td>Unit Test VI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.5 Hours

Total: 45 Hours

Reference(s)

15LE202 COMMUNICATIVE ENGLISH II 3 0 0 3

Course Objectives
To acquire skills for using English in workplace effectively
To communicate for essential business needs
To prepare students for taking BEC Vantage level examination which is an International Benchmark for English language proficiency of Cambridge English Language Assessment (CELA)
To enhance the communicative ability from Intermediate to Upper Intermediate level

Course Outcomes (COs)
To enable students to get International recognition for work and study.
To use English confidently in the International business environments.
To be able to take part in business discussion, read company literature, write formal and informal business correspondences and listen and understand business conversations.
UNIT I  
GRAMMAR AND VOCABULARY  
9 Hours  
Simple, compound and complex sentences - Direct and indirect speech - Conditionals - Business vocabulary - Collocations - Discourse markers

UNIT II  
LISTENING  
9 Hours  
Listening to identify topic, content, function - Sentence stress - Rhythm - Intonation

UNIT III  
READING  
9 Hours  
Reading graphs and charts - Skimming and scanning texts - Job advertisements - Read business articles for specific information - Understanding the structure of a text - Error identification

UNIT IV  
WRITING  
9 Hours  
Formal and Informal English - Longer Documents: writing individual paragraphs to longer text, Business Correspondence, Reports and Proposals - Transcoding

UNIT V  
SPEAKING  
9 Hours  
Collaborative task - Turn taking (initiating and responding appropriately) - Negotiating - Exchanging information - Language Functions: suggesting - comparing and contrasting - expressing - Finding out facts, attitudes and opinions - Commonly mispronounced words

FOR FURTHER READING  
Reading Novels (The Monk Who Sold His Ferrari by Robin Sharma; Three Mistakes of my Life by Chetan Bhagat; The Fountainhead by Ayn Rand)  
Total: 45 Hours

Reference(s)  

15LC203 CHINESE  
3 0 0 3

Course Objectives (COs):  
To help students acquire the basics of Chinese language  
To teach them how to converse in Chinese in various occasions  
To teach the students the Chinese cultural facets and social etiquettes

Course Outcomes (COs):  
Improve fluency in Chinese  
Clarity on the basic sounds of the Chinese Language

Unit I  
9 Hours  
Nǐ hǎo - 你好  
Xuéhuì wènhòu de jīběn biǎodá yòngyǔ - 学会问候的基本表达用语; Xuéhuì jièshào zìjǐ de xìngmíng, guójí - 学会介绍自己的姓名，国际; Xuéhuì hányǔ pǐnyīn de shèngmù -
### Unit II

**9 Hours**

**Xuèhuì shìjiān, rìqí de biǎodá** - 学会时间，日期的表达；

**Rèshēn** - 热身；

**Jùzi** - 句子；

**Shēngcí** - 生词；

**Huó dòng** - 活动；

**Kàn tú wánchéng huìhuà** - 看图完成会话；

**Dú yī dú ránhòu lián xiàn** - 读一读然后连线；

**Bǎ xiàmiàn de cí àn zhèngquè de shùnxù páilì chéngjù** - 把下面的词按正确的顺序排列成句。

### Unit III

**9 Hours**

**Nà jiàn máoyī zěnme mài?** - 那件毛衣怎么卖？

**Xún wèn jiātíng qíngkuàng, zhíyè hé niánlíng** - 询问家庭情况，职业和年龄；

**Jùzi** - 句子；

**Shēngcí** - 生词；

**Huó dòng** - 活动；

**Kàn tú wánchéng huìhuà** - 看图完成会话；

**Dú yī dú ránhòu lián xiàn** - 读一读然后连线；

**Tīng lùyīn xuǎnzé zhèngquè dǎ'àn** - 听录音选择正确答案；

**Bǔchōng cí yǔ biǎo** - 补充词语表。

### Unit IV

**9 Hours**

**Nǐ zài nǎ'ér gōngzuò** - 你在哪儿工作

**Xué huì xún wèn jiā tíng qíng kuàng, zhí yè hé nián líng** - 询问家庭情况，职业和年龄

**Jùzi** - 句子；

**Shēngcí** - 生词；

**Huó dòng** - 活动；

**Kàn tú wánchéng huì huà** - 看图完成会话；

**Dú yī dú ránhòu lián xiàn** - 读一读然后连线；

**Tīng lùyīn xuǎnzé zhèngquè dǎ'àn** - 听录音选择正确答案；

**Bǔchōng cí yǔ biǎo** - 补充词语表；

**Jù le shéng yǔ bǐ àn** - 角色扮演；

**Tīng lùyīn pà duàn duì cuò** - 听录音判断对错。

### Unit V

**9 Hours**

**Nǐ zài nǎ'ér gōngzuò** - 你在哪儿工作

**Xué huì xún wèn jiā tíng qíng kuàng, zhí yè hé nián líng** - 询问家庭情况，职业和年龄

**Shēngcí** - 生词；

**Jùzi** - 句子；

**Huó dòng** - 活动；

**Kàn tú wánchéng huì huà** - 看图完成会话；

**Dú yī dú ránhòu lián xiàn** - 读一读然后连线；

**Tīng lùyīn xuǎnzé zhèngquè dǎ àn** - 听录音选择正确答案；

**Bǔchōng cí yǔ biǎo** - 补充词语表；

**Tīng lùyīn pà duàn duì cuò** - 听录音判断对错。

### Total: 45 Hours

**Reference books:**

- Mandarin Day - Hancel Don: Chinese Learning Software
- My Chinese Classroom - David J. White

**Web Reference(s):**

15LF203 FRENCH

Course Objectives
- To help students acquire the basics of French language
- To teach them how to converse in French in various occasions

Course Outcomes (COs)

The students will become familiar with the basics of French language and start conversing in French.

UNIT I
Alphabet Français (alphabets) - Les Accents Français (the accents in French) - aigu - grave - circonflexe - tréma cédille - écrire son nom dans le français (spelling one's name in French) - Les noms de jours de la semaine (Days of the week)

UNIT II
Les noms de mois de l'année (Months) - Numéro 1 à 100 (Numbers 1 to 100) GRAMMAIRE: Conjugaison

UNIT III
Moyens de transport (Transport) - Noms de Professions (Professions) - Noms d'endroits communs (Places) - Nationalités (Nationalities) ÉCOUTER: (Listening) Écouter et répondre PARLER (Speaking) Présentation - même /Présentez - Vous (Introducing oneself) LIRE: (Reading) Écouter et répondre PARLER (Speaking) Présentation - même /Présentez - Vous

UNIT IV
Pronoms (Pronouns) - Noms communs masculins et de femme (Common masculine and feminine nouns) - Verbes communs (Common verbs) COUTER: couter et crier les prnoms - Observer les dessins et couter les dialogues LIRE: (Reading) Lire les profils d'utilisateurs d'interlingua (alter ego) PARLER: Parler de sa ville - Parler de sa profession

UNIT V
Narration de son nom et l'endroit où on vit - Son âge et date de naissance - Numéro de téléphone et dresse - Narration du temps - La France en Europe PARLER: Conversation entre deux amis - Jouer la scène ÉCOUTER: Écouter les conversations (CD alter ego) ÉCRIRE: Écrire une carte postale

Total: 45 Hours

Reference(s)
Alter ego+ Niveau a1 ,Catherine Hugot., HACHETTE LIVRE 2012
Cahier alter ego+
Grammaire Progressive du Français, CLE international, 2010
Collins Easy Learning French Verbs& Practice, Harpercollins, 2012
Barron's Learn French, 3rd edition
15LG203 GERMAN

Course Objectives
To help students acquire the basics of German language
To teach them how to converse in German in various occasions

Course Outcomes (COs)
An ability to communicate effectively with: (a) Clarity on the basic sounds of the German language (b) Improved fluency in German (c) Proper vocabulary

UNIT I
GRAMMAR

UNIT II
LISTENING
Listening to CD supplied with the books, paying special attention to pronunciation: Includes all lessons in the book - Greetings - talking about name - country - studies - nationalities - ordering in restaurants - travel office - Interaction with correction of pronunciation.

UNIT III
SPEAKING
Speaking about oneself - about family - studies - questions and answers - dialogue and group conversation on topics in textbooks - talks on chosen topics.

UNIT IV
READING:
Reading lessons and exercises in the class - pronunciation exercises: Alphabet - name, country, people, profession, family, shopping, travel, numbers, friends, restaurant, studies - festivals

UNIT V
WRITING
Alphabets, numbers - words and sentences - Exercises in the books - control exercises - writing on chosen topics such as one self, family, studies - country.

Total: 45 Hours

Reference(s)

15LH203 HINDI

Course Objectives
To help students to acquire the basics of Hindi
To teach them how to converse in Hindi on various occasions
To help learners acquire the ability to understand a simple technical text in Hindi
Course Outcomes (COs)

An ability to communicate effectively with: (a) Improved fluency in Hindi (b) Clarity on the basic sounds of the Hindi language (c) Proper vocabulary

UNIT I
HINDI ALPHABET
9 Hours
Introduction - Vowels - Consonants - Plosives - Fricatives - Nasal sounds - Vowel Signs - Chandra Bindu & Visarg - Table of Alphabet - Vocabulary.

UNIT II
NOUNS IN HINDI
9 Hours
Genders (Masculine & Feminine Nouns ending in a , e, i, o, u,)- Masculine & Feminine - Reading Exercises.

UNIT III
PRONOUNS AND TENSES
9 Hours
Categories of Pronouns - Personal Pronouns - Second person (you & honorific) - Definite & Indefinite pronouns - Relative pronouns - Present tense - Past tense - Future tense - Assertive & Negative Sentences - Interrogative Sentences.

UNIT IV
CLASSIFIED VOCABULARY
9 Hours
Parts of body - Relatives - Spices- Eatables - Fruit & Vegetables - Clothes - Directions - Seasons - Professions.

UNIT V
SPEAKING
9 Hours
Model Sentences - Speaking practice for various occasions.

Total: 45 Hours

Reference(s)

15LJ203 JAPANESE

Course Objectives

To help students acquire the basics of Japanese language
To teach them how to converse in Japanese in various occasions
To teach the students the Japanese cultural facets and social etiquettes

Course Outcomes (COs)

An ability to communicate effectively with: (a) Improved fluency in Japanese (b) Clarity on the basic sounds of the Japanese language (c) Proper vocabulary

UNIT I
Introduction to Japanese - Japanese script - Pronunciation of Japanese (Hiragana) - Long vowels - Pronunciation of in, tsu, ga - Letters combined with ya, yu, yo - DailyGreetings and Expressions -
UNIT II  9 Hours
Introduction - Kore - Sore - are - Kono N1 - Sono N1 - ano N1 - so des - so ja arimasen - S ka - N1mo - N1 no N2 - .san - Kanji - Technical Japanese Vocabulary (25 Numbers) - Phonetic and semantic resemblances between Tamil and Japanese

UNIT III  9 Hours

UNIT IV  9 Hours
Introduction to Adjectives - N1wanaadj des. N1 wa ii adj des - naadja N1 - ii adj ii N1 - Thothemo - amari - N1 wadho des ka - N1 wadhonna N2 des ka - S1 ka S2 - dhore - N1 gaarimasu - wakarimasu - N1 ga suki masu - N1 gakiraimasu - jozu des - hetha des - dhonna N1 - Usages of yoku - dhaithai - thakusan - sukoshi - amari - zenzen - S1 kara S2 - dhoshithe, N1 gaarimasu - imasu - N1(Place) ne N2 gaarimasu - imasu - N1 wa N2(Place) ne arimasu - iimasu - N1(Person,Place,or Thing ) no N2 (Position) - N1 ya N2, Kanji-10 - Japanese Dictionary usage using JWPCE Software, Technical Japanese Vocabulary (25 Numbers)

UNIT V  9 Hours

Total: 45 Hours

Reference(s)

Software(s):
Nihongo Shogo-1
Nihongo Shogo-2
JWPCE Software

Web Reference(s):
www.japaneselifestyle.com/
www.learn-japanese.info/
www.kanjisite.com/
www.learn-hiragana-katakana.com/typing-hiragana-characters/
CHEMISTRY ELECTIVES
15CH201 ENGINEERING CHEMISTRY 3 0 2 4

Course Objectives
- recall the terminologies of electrochemistry and explain the function of batteries and fuel cells with its electrochemical reactions
- understand the fundamentals of corrosion, its types and polymers with its applications
- choose appropriate instrumentation technique for interpreting analytical data

Course Outcomes (COs)
- construct an electrochemical cell and measure its potential.
- identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications.
- utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion control processes.
- differentiate the polymers used in day to day life based on its source, properties and applications.
- identify the applications of analytical methods for the estimation of elements in aqueous media.

UNIT I
INTRODUCTION TO ELECTROCHEMISTRY

UNIT II
ENERGY STORAGE DEVICES
- Batteries - characteristics of battery - types of batteries, construction, working and applications: Primary (alkaline) and secondary (lead-acid and nickel-cadmium) - Modern batteries (zinc air battery and lithium batteries) - precautions for battery maintenance. Comparison with conventional galvanic cells. Fuel cells - Types of fuel cells: solid polymer electrolyte fuel cell - solid oxide fuel cells - microbial fuel cell. Hydrogen-oxygen fuel cell - construction, working, advantages and limitations.

UNIT III
CORROSION SCIENCE

UNIT IV
POLYMERS AND ITS PROCESSING
- Advantages of polymers over metals. Monomers - polymers - polymerization - functionality - degree of polymerization - classification of polymers based on source and applications - Molecular weight determination. Types of polymerization: addition, condensation and copolymerization - mechanism of free radical polymerization. Preparation, properties and applications of thermosetting (epoxy resin and
bakelite) and thermoplastics (polyvinyl chloride and polytetrafluoroethylene). Compounding of plastics - injection and extrusion moulding methods.

UNIT V
INSTRUMENTATION TECHNIQUES FOR CHEMICAL ANALYSIS
Beer - Lamberts law. Principle, instrumentation (block diagram only) and applications: UV-visible spectroscopy - Atomic absorption spectroscopy - Colorimetry (estimation of a transition metal) - Flame photometry (estimation of an alkali metal).

FOR FURTHER READING
Nobel prize winners in chemistry over past 5 years

EXPERIMENT 1
Preparation of N/10 oxalic acid and M/10 sodium carbonate solution.

EXPERIMENT 2
Determination of strength of hydrochloric acid present in the given solution by pH measurement.

EXPERIMENT 3
Determination of strength of HCl by conductometric titration.

EXPERIMENT 4
Conductometric titration of mixture of acids (Hydrochloric acid and acetic acid).

EXPERIMENT 5
Estimation of iron in the given sample by potentiometric method using saturated calomel electrode.

EXPERIMENT 6
Measurement of rate of corrosion on zinc/mild steel in aerated neutral/acidic/alkaline solution by weight loss method.

EXPERIMENT 7
Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.

EXPERIMENT 8
Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method.

Total: 75 Hours

Reference(s)
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1 1 1 1</td>
<td>3 4 2</td>
<td>4 4</td>
<td>1 2</td>
<td>1 2</td>
<td>1 2</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>1 1 1 1</td>
<td>4 4 3</td>
<td>1 2</td>
<td>1 2</td>
<td>1 2</td>
<td>1 2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>1 1 1 1</td>
<td>2 2 1</td>
<td>2 2</td>
<td>2 1</td>
<td>2 1</td>
<td>2 1</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>5 3 2 1</td>
<td>3 1 1</td>
<td>1 2</td>
<td>2 2</td>
<td>1 2</td>
<td>1 2</td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>1 1 1 1</td>
<td>3 1 1</td>
<td>1 2</td>
<td>2 2</td>
<td>1 2</td>
<td>1 2</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

- List any four significances of EMF series.
- Define the term single electrode potential.
- Recall the four advantages of H2-O2 fuel cell.
- Define the term functionality of a monomer.
- State Pilling-Bedworth rule.
- Name two monomers used for the preparation of epoxy resin.
- Label the parts and charge carried by electrodes in electrochemical and electrolytic cells.
- List any two significances of monomer functionality.
- State Beer-Lamberts law.
- Define concentration cell.

Understand

- Classify two types of polymers based on source.
- Compare electrochemical cell and electrolytic cell with suitable diagrams.
- Illustrate the mechanism involved in electrochemical corrosion.
- Explain the principle and five components of UV-visible spectrophotometer.
- Outline the mechanism for the synthesis of -(CF2-CF2)n– polymer.
- Identify any two analytical methods to estimate sodium present in aqueous media.
- Illustrate the injection molding process with a necessary explanation and two advantages.
- Indicate any two importance of salt bridge in an electrochemical cell.
- Illustrate the route to synthesis epoxy resin from its two monomers.
- Summarize any four advantages of polymers over metals in everyday life.

Apply

- Calculate the single electrode potential value zinc half-cell dipped in a 0.01M ZnSO4 solution at 25°C? F° Zn/Zn 2+= 0.763 V, R=8.314 JK-1 Mol-1 , F= 96500 Coulombs.
- Identify two advantages of degree of polymerization.
- Find the concentration of given solution using spectrophotometer, if %T, bath length and molar adsorption coefficient are 18, 1 cm and 6000 L/mol. cm.
- Derive an equation for determination pH of unknown solution using glass electrode.
- Elaborate any six applications of electrochemical series.
- Select and explain suitable potentiometric titration to estimate the amount of ferrous ion in the given solution.
- Discuss the construction and working of electrolyte concentration cell with suitable example.
- Assess the significance of functionality of monomer in the properties and structure of polymer.

Analyse

- Outline any two methods for preventing chemical and electrochemical corrosion.
- Compare the advantages and limitations of electro and electroless plating of nickel.
- The statement “prevention is better than cure” is not suitable for corrosion science and engineering-Justify your answer.
- Differentiate addition and condensation polymers based on its synthesis.
- Arrange the following polymers based on the increasing order of resistance towards chemical
Evaluate

Calculate the electrode potential of zinc metal if EMF of the cell is 1.10 V (Sat. Calomel electrode was used for complete cell formation. Electrode potentials of A and B are $E_0 A/A^+ = +0.76 \text{ V}$ and $E_0 B/B^+ = -0.34 \text{ V}$ respectively. Choose the appropriate anode half-cell and cathode half-cell by giving the cell representation.

Find out the degree of polymerization for a low density polytetrafluoroethylene with a molecular weight of 10002 amu. (Atomic weights of F=18.9; C=12)

The standard reduction potentials of metals Ag, Fe, Cu and Zn are +0.80v, -0.44v, +0.34v and -0.76v respectively. Arrange the metals in the increasing order of their ability to undergo corrosion.

Create

A ship hull in ocean is safe against corrosion under any circumstance - Give reason.

Derive the probable reason and possible solution for the following:

Stainless steel should not be used to build ship hull.

Small anodic area results in intense corrosion.

Metal under water drop undergoes accelerated corrosion.

15CH202 APPLIED CHEMISTRY

Course Objectives

understand the necessity of water softening processes.

recognize the fundamentals of corrosion, alloys, phase rule and fuels with its applications.

characterize the chemical compounds using analytical techniques.

Course Outcomes (COs)

identify the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.

understand the type of corrosion and its mechanism which will help to develop the corrosion control methods.

apply the applications of alloying and phase rule in the field of metallurgy.

analyse the three types of fuels based on calorific value for selected applications.

recognize the applications of analytical methods in characterizing the chemical compounds.

UNIT I

WATER PURIFICATION

UNIT II  
CORROSION SCIENCE  
8 Hours  

UNIT III  
ALLOYS AND PHASE RULE  
9 Hours  

Phase rule: phase - component - degree of freedom - phase rule - phase diagram - applications - one component system (water system). Reduced phase rule - two component system (lead and silver system).

UNIT IV  
FUELS  
10 Hours  

UNIT V  
INSTRUMENTAL METHODS  
8 Hours  
Beer - Lambert's law. Principle, instrumentation (block diagram only) and applications: Ultra violet spectroscopy - Infrared spectroscopy - Atomic absorption spectroscopy - Colorimetry (estimation of transition metal) - Flame photometry (estimation of alkali metal).

FOR FURTHER READING  
Synthesis and applications of bio-fuels.

EXPERIMENT 1  
Preparation of N/10 oxalic acid and N/10 sodium carbonate solution.

EXPERIMENT 2  
Water quality of BIT campus - River - Bore well water with respect to hardness, TDS and pH.

EXPERIMENT 3  
Conductometric titration of mixture of acids (HCl CH3COOH).

EXPERIMENT 4  
Determination of strength of hydrochloric acid in a given solution using pH meter.

EXPERIMENT 5  
Determination of the strength of Fe(II) in the given sample by potentiometric method.
EXPERIMENT 6
Measurement of rate of corrosion on mild steel in aerated / neutral / acidic / alkaline medium by weight loss method.

4 Hours

EXPERIMENT 7
Estimation of copper content in brass by EDTA method.

4 Hours

EXPERIMENT 8
Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method.

Total: 75 Hours

Reference(s)


Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

Define the term hardness of water.
List any two internal conditioning methods to convert hard water to soft water.
List the two types of electrochemical corrosion.
Recall any two reasons for galvanic corrosion.
List the four major objectives of alloying steel.
State Gibbs phase rule.
Define octane number.
State Beer-Lambert’s law.
Recall any four applications of colorimetry.

Understand

Compare temporary and permanent hardness in water.
Illustrate the estimation of carbonate, non-carbonate and total hardness by EDTA method.
Identify the needs of corrosion control methods with suitable examples.
Indicate the two suitable conditions for electrochemical corrosion to occur.
Classify the three types of alloys based on metal composition.
For one component water system, the triple point is an invariant point. Reason out.
Distinguish between syn gas and coal gas.
With a neat diagram, explain the processes involved in Bergius process to get synthetic petrol.
Differentiate chromophore and auxochrome with an example.
Infer the role of ammonium thiocyanate in the colorimetric estimation of iron.

Apply
- Illustrate the necessary steps involved in municipal water treatment.
- Suggest a suitable laboratory method to estimate carbonate, non-carbonate and total hardness of water.
- Sketch a suitable protection method to prevent ship’s hull made of iron from corrosion.
- Assess the effects of alloying elements.
- Apply Gibbs phase rule for one component water system with a neat diagram.
- Find the combusted products of the following components.
  2H2 (ii) CH4
- Find the application of colorimetry for the estimation of iron.
- Calculate the number of the modes of vibrations for the following molecules.
  C6H6 (ii) CO2

Analyse
- How can the effect of caustic embrittlement in boiler be resolved?
- Identify the problems created in boilers if priming and foaming takes place.
- Increase in temperature increases corrosion rate. Justify.
- Zinc is more corroded when coupled with copper than lead – Reason out.
- Distinguish ferrous and non-ferrous alloys with examples.
- Arrange the following materials based on their increasing calorific value. peat, lignite, bituminous, wood, anthracite and sub-bituminous.

Evaluate
- Bolt and nut made of the same metal is preferred in practice. Give reason.
- Support the statement “Coke is a better fuel than coal”.
- Calculate the absorbance if 10% of light is transmitted.
- Determine the effect of pH of the conducting medium on corrosion.
- Determine the number of phases present in the following systems.
  - Two miscible liquids (alcohol & water)
  - Two immiscible liquids (benzene & water)

Create
- Derive the probable reason and possible solution for the following:
  - Stainless steel should not be used to build ship hull.
  - Small anodic area results in intense corrosion.
  - Metal under water drop undergoes accelerated corrosion.
- 1. AAS is a better method for environmental analysis than calorimetric analysis. Justify.

**15CH203 APPLIED ELECTROCHEMISTRY**  
3 0 2 4

**Course Objectives**
- Understanding the basic concepts of electrochemistry and their application
- Expanding knowledge about corrosion and methods of control
- Gaining information regarding principle, working and application of batteries and fuel cells

**Course Outcomes (COs)**
- Construct an electrochemical cell and calculate its cell potential.
- Measure the emf of a cell using different electrodes.
- Identify the components and processes in batteries and infer the selection criteria for commercial battery systems with respect to different applications.
Differentiate types of corrosion and its prevention by suitable techniques.
Recognize the importance of fuel cells and solar battery.

UNIT I
FUNDAMENTALS OF ELECTROCHEMISTRY
Introduction - electrical conductance in solution - electrical double layer - electrode potential - importance of electrode potential. Electrochemical cell - standard cell: Weston cadmium cell - Concentration cell: electrode and electrolyte - applications. Applications of electrolytic cells: electrolysis of water, electrolysis of brine and electroplating of copper and gold

UNIT II
REFERENCE ELECTRODES

UNIT III
ENERGY STORING DEVICES
Types of batteries - alkaline, lead-acid, nickel-cadmium and lithium batteries - construction, working and commercial applications. Electrochemical sensors. Decomposition potential: variation of decomposition potential for different metals - importance of decomposition potential. Over voltage: factors affecting over voltage value. Maintenance and precautions in battery handling

UNIT IV
CORROSION SCIENCE

UNIT V
FUEL CELL AND SOLAR BATTERY

FOR FURTHER READING
Document the various batteries with its characteristics used in mobile phones and laptops
Maintenance free batteries, Battery recycling

EXPERIMENT 1
General instructions to students - Handling reagents and safety precautions.

EXPERIMENT 2
Determination of strength of a commercial mineral acid by conductometric titration.

EXPERIMENT 3
Electroplating of copper onto a stainless steel object.
EXPERIMENT 4
Determination of strength of iron in a given solution by potentiometric method.  

4 Hours

EXPERIMENT 5
Determination of amount of hydrochloric acid present in the given sample using pH meter.  

4 Hours

EXPERIMENT 6
Conductometric titration of mixture of acids.  

4 Hours

EXPERIMENT 7
Determination of corrosion inhibition on mild steel using natural inhibitors.  

4 Hours

EXPERIMENT 8
Estimation of barium by precipitation titration.  

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2  2</td>
<td>2  1  1</td>
<td>2  1  1  2</td>
<td>2  1</td>
<td>1  1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1  4</td>
<td>2  4  1</td>
<td>2  1  2</td>
<td>1  2</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1  1</td>
<td>4  5</td>
<td>2  4  2  1</td>
<td>1  2</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2  1</td>
<td>2  5  1</td>
<td>3  2  2  2</td>
<td>2</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2  2</td>
<td>1  4</td>
<td>2  1  2  2</td>
<td>1</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
List any two advantages of hydrogen oxygen fuel cells.
Name any two secondary batteries used in electronic appliances.
State piling bedworth rule.
List any two applications of lithium battery.
Define overvoltage.
Recall the two limitations of quinhydrone electrode.
List the three major applications of galvanic series.
Recall the term redox reaction.
Define standard electrode potential.

Understand
Identify any two factors affecting the rate of corrosion based on the nature of metal.
Compare solar battery with lead acid-battery with respect to cell reactions, advantages and limitations.
Explain the working of hydrogen-oxygen fuel cell with necessary diagram and cell reactions. Mention its two advantages and limitations.
Identify the four advantages of electroless plating over electroplating.
Explain the difference between galvanic and differential aeration corrosion with an example each.
Summarize any five factors that affect overvoltage value of a cell.
Differentiate cell from battery.
Sketch and explain the construction and working of saturated calomel electrode with necessary cell reactions.
With a neat sketch explain the working of a silver – silver chloride electrode.
Elucidate the working principle of Weston cadmium cell with suitable cell reactions.
Distinguish galvanic and electrolytic cells based on cell reactions.

Apply
1. Assess the six advantages of solid polymer electrolyte fuel cell.
2. Many metals form oxide layer when exposed to atmospheric conditions due to corrosion. Predict the four types of metal oxide layers formed with two examples each.
3. An iron pipe line buried under soil is used to carry natural gas, suggest any two corrosion control techniques that can be employed to minimize/control corrosion.
4. Predict the type of corrosion taking place when a piece of iron rod is exposed to moisture and explain the mechanism of rust formation.
5. Illustrate the construction of 6V lead-acid battery and explain its functioning during discharging and charging process.
6. Select a suitable secondary storage battery used in mobile phones. Explain its reactions during charging and discharging process.
7. Find the electrode potential of zinc rod using saturated calomel electrode as reference electrode (E cell value is 1.10 V).
8. Apply the principle of ion selective electrode to find the pH of HCl solution using glass electrode with necessary equations.
9. Can we use KCl salt bridge to construct a cell using Ag and Pb half-cell. Give reason.
10. Identify a suitable technique to achieve copper coating on stainless steel object with a neat diagram.

Analyse
Can you store zinc sulphate solution in a copper container? Give reason if your answer is yes/no.
Predict why copper cannot displace hydrogen from mineral acid solution.
Compare a deep cycle battery and a starting battery based on its application.
Zinc corrodes at a faster rate when coupled with copper than lead. Give reason.
Does the water exhaust from hydrogen - oxygen fuel cell is drinkable? Give reasons if Yes/No.

Evaluate
Electrode potentials of A and B are E0A/A+ = +0.76 V and E0B/B+ = -0.34 V respectively. Choose the appropriate anode half-cell and cathode half-cell by giving the cell representation.
Glass electrode cannot be used in solutions having pH greater than 9.0. Give reason.
Represent diagrammatically an electrochemical cell that produces 1.1 volt as an output. Write the half-cell reactions responsible for that. The standard reduction potentials of metals Ag, Fe, Cu and Zn are +0.80v, -0.44v, +0.34v and -0.76v respectively. Arrange the metals in the increasing order of their ability to undergo corrosion. Identify any two advantages of microbial fuel cell over lead acid battery.

Create

Derive the probable reason and possible solution for the following:
Stainless steel should not be used to build ship hull.
Small anodic area results in intense corrosion.
Metal under water drop undergoes accelerated corrosion.
As an engineer, which type of metal oxide forming metal you will choose for your design? Reason out.

15CH204 INDUSTRIAL CHEMISTRY

Course Objectives
impart knowledge on the principles of water characterization, treatment methods and industrial applications
understand the principles and applications of electrochemistry, fuels and combustion
recognize the fundamentals of polymers, nano chemistry and analytical techniques

Course Outcomes (COs)
identify the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.
utilize the concepts of electrochemistry in real time applications.
realize the importance of fuel chemistry in day to day life.
differentiate the polymers used in day to day life based on its source, properties and applications
familiarize with the synthesis and characterization techniques of nanomaterials.

UNIT I 10 Hours
WATER PURIFICATION TECHNOLOGY: SOFTENING AND DESALINATION

UNIT II 10 Hours
ELECTROCHEMISTRY
Introduction - EMF - Single electrode potential - Calomel electrode - Glass electrode - pH measurement using glass electrode - Electrochemical series. Cells: Electrochemical cells - Cell reactions- Reversible cells and irreversible cells. Batteries - characteristics of battery - types of batteries, construction, working and applications: Primary (alkaline) and secondary (lead-acid and nickel-cadmium) - Modern batteries (zinc air battery and lithium batteries) - precautions for battery maintenance. Fuel cell: Hydrogen - Oxygen fuel cell.Electroplating of copper and electroless plating of nickel
UNIT III  
FUELS AND COMBUSTION  
Fue: Introduction - classification of fuels - calorific value - higher and lower calorific values - analysis of coal (proximate and ultimate) - carbonization - manufacture of synthetic petrol (Bergius process) - knocking - octane number - cetane number - natural gas - Compressed Natural Gas (CNG) - Liquefied Petroleum Gases (LPG) - producer gas - water gas. Combustion of fuels: introduction-theoretical calculation of calorific value - calculation of stoichiometry of fuel and air ratio - ignition temperature

UNIT IV  
POLYMER AND COMPOSITES  
Monomers - functionality - degree of polymerizations - classification of polymers based on source and applications; porosity - tortuosity - molecular weight determination by Ostwald method - polymerization methods: addition, condensation and copolymerization - mechanism of free radical polymerization - thermosetting and thermoplastics. Polymer blends - composites, significance, blending-miscible and immiscible blends, phase morphology, fibre reinforced plastics, long and short fibre reinforced composites

UNIT V  
NANOMATERIALS  

FOR FURTHER READING  
Application of nanomaterials in medicine, environment, energy, information and communication sectors

EXPERIMENT 1  
General instructions to students - Handling reagents and safety precautions

EXPERIMENT 2  
Water quality of BIT campus - River - Bore well water with respect to hardness, TDS and pH

EXPERIMENT 3  
Determination of strength of hydrochloric acid in a given solution using pH meter

EXPERIMENT 4  
Determination of strength of a commercial mineral acid by conductometric titration

EXPERIMENT 5  
Conductometric titration of mixture of acids

EXPERIMENT 6  
Determination of the strength of iron in the given sample by potentiometric method

EXPERIMENT 7  
Determination of molecular weight of polyvinyl alcohol by Ostwald viscometry method
EXPERIMENT 8
Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method

**Reference(s)**


A. Pahari and B.Chauhan, Engineering Chemistry, Infinity Science press LLC, New Delhi, 2010


S. Sarkar, Fuels and combustion, 3rd edition, Orient Longman Ltd. New Delhi, 2010

**Assessment Pattern**

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Total: 100

**Assessment Questions**

**Remember**

- Define the term break point chlorination.
- Name a method to prevent the scale formation in the industrial boilers.
- Define single electrode potential of an electrode.
- List any two advantages of H2-O2 fuel cell.
- Define functionality of a monomer.
- Name any two thermoplastic and thermosetting polymers.
- List any two applications of SEM.
- Recall any two application of X-Ray diffractometer.
- List three factors which affects the standard electrode potential of cell.

**Understand**

- Illustrate any three applications of electrochemical series.
- Summarize the four applications of calorimeter.
- Explain the components of TEM with a neat sketch.
- Compare bottom up approach with top down approach of nanoparticle synthesis.
- Distinguish between alkaline and non alkaline hardness.
- Differentiate between thermoplastic and thermosetting plastics
- Why copper cannot displace hydrogen from mineral acid solution?
- Identify two significances of RO method in water treatment.
- Indicate any two advantages of water gas over producer gas.
- Compare nanocluster with nanocrystal.
- Identify the reasons for change of properties of materials at nanoscale.

**Apply**

A water sample contains 204 mgs of CaSO4 and 73 mgs of Mg(HCO3)2 per litre. Calculate the total hardness in terms of CaCO3 equivalence.
100 ml of sample water has hardness equivalent to 12.5 ml of 0.08 N MgSO₄. Calculate hardness in ppm.

Find out the single electrode potential of a half cell of zinc electrode dipped in a 0.01 M ZnSO₄ solution at 25°C? 

\[ \text{E}^\circ\text{Zn/Zn}^{2+} = 0.763 \text{ V} \]

\[ \text{R} = 8.314 \text{ JK}^{-1}\text{Mol}^{-1} \]

\[ \text{F} = 96500 \text{ Coulombs} \]

Calculate the reduction potential of Cu²⁺/Cu at 25°C.

\[ \text{E}^\circ\text{Cu}^{2+}/\text{Cu} = +0.337 \text{V} \]

Find out the weight and volume of air required for the complete combustion of 1 kg of coke.

A sample of coal containing 60% C, 6% H, 33% O, 0.5% S, 0.2% N and 0.3% ash. Find the gross and net calorific value of coal.

Calculate the degree of polymerization of polypropylene having molecular weight of 25200.

Apply the principle of ion selective electrode to determine the pH of HCl solution using glass electrode with equations.

**Analyse**

Calgon conditioning is advantageous over phosphate conditioning - reason out.

Soft water is not demineralized water whereas demineralized water is a soft water - justify.

Hydrogen electrode is not generally used for pH measurements – Why?

Zinc reacts with dil H₂SO₄ to give hydrogen but silver doesn’t liberate hydrogen. Give reasons.

Good fuel should have low ash content - give reasons.

Sugar is an example of non-electrolyte - reason out.

**Evaluate**

Hydrogen fuel is an ideal fuel for the future among all other fuels - justify.

Choose a best method for water purification and explain their components.

**15CH205 WATER TECHNOLOGY AND GREEN CHEMISTRY**

**Course Objectives**

Imparting the knowledge on the principles of water technology and green chemistry

Understanding the principles and applications of green technology in water treatments

Infer the engineering applications of green chemistry in dyes, corrosion engineering and nanotechnology

**Course Outcomes (COs)**

Understand the importance of green chemistry with its emergence and development.

Realize the designing of safer methodologies for green technology to meet the objectives of green engineering.

Identify the type of corrosion and its mechanism which will help to develop the corrosion control methods.

Apply suitable techniques to extract natural dye from its source.

Familiarize with the synthesis and characterization techniques of nanomaterials.

**UNIT I**

9 Hours

**WATER TREATMENT**

UNIT II  
WASTE WATER ANALYSIS  
8 Hours  
Basic principles and concept of green chemistry - Need of green chemistry in day-to-day life -  
Scientific areas for practical applications of green chemistry - Industrial effluents - Waste water  
analysis: Concept of chemical oxygen demand (COD) and biological oxygen demand (BOD) -  
Removal of trace pollutants in waste water: Membrane Bioreactor (MBR) technology - Wet  
oxidation method.

UNIT III  
CHEMISTRY OF CORROSION  
10 Hours  
Corrosion: Mechanism of corrosion - chemical and electrochemical - Pilling-Bedworth rule - oxygen  
absorption - hydrogen evolution - galvanic series. Types of corrosion: Galvanic corrosion -  
differential aeration corrosion (pitting, pipeline, water line and wire fence corrosion) - factors  
influencing corrosion. Methods of corrosion control: choice of metals and alloys - proper designing -  
cathodic protection (Sacrificial anode method, impressed current method) - modifying the  
environment. Protective coatings: Concept of electroplating: electroplating (gold and copper) -  
electroless plating (nickel and copper).

UNIT IV  
NATURAL DYES  
9 Hours  
Introduction - definition - classification of natural dyes - concept of chromophores and auxochromes -  
Extraction process of colour component from natural dyes: Aqueous extraction, non-aqueous  
extraction - Purification of natural dyes: Chromatography techniques - Types - Column  
chromatography - thin layer chromatography - Qualitative analysis: UV-Visible spectroscopic study  
- Mordant: Metallic and non-metallic mordant - advantages and disadvantages of natural dyes.

UNIT V  
NANOMATERIALS  
9 Hours  
Types of Nanomaterials - Nano particles - nanoclusters - nano rod - nanowire - nano tube. Synthesis:  
Top down process: laser ablation - electrodeposition - chemical vapor deposition. Bottom up  
process: Precipitation - thermolysis - hydrothermal - solvothermal process. Carbon nanotubes: Types  
- production - properties - applications. Working principle and applications: Scanning Electron  
Microscope (SEM) - Transmission Electron Microscope (TEM) - UV- Visible spectrophotometer.  
Synthesis of Au and Ag nanoparticles using plant extract - Advantages.

FOR FURTHER READING  
Protection of metals in concrete against corrosion  
Microwave technology on green chemistry  
2 Hours  

EXPERIMENT 1  
General instructions to students - Handling reagents and safety precautions  
4 Hours  

EXPERIMENT 2  
Water quality - river/bore well water with respect to hardness and TDS  
4 Hours  

EXPERIMENT 3  
Determination of strength of hydrochloric acid in a given solution using pH meter  
4 Hours  

EXPERIMENT 4  
Estimation of strength of iron by potentiometric method using calomel electrode  
4 Hours
EXPERIMENT 5
Extraction of a natural dye by aqueous extraction method

4 Hours

EXPERIMENT 6
Measurement of rate of corrosion of mild steel in aerated neutral/acidic/alkaline solution by weight loss measurements/Tafel polarization method

4 Hours

EXPERIMENT 7
Determination of dye concentration in a given sample by using UV-Visible spectroscopic method

4 Hours

EXPERIMENT 8
Estimation of iron (thiocyanate method) in the given solution by spectrophotometric method

4 Hours

Total: 75 Hours

Reference(s)


Ashis Kumar Samanta and Adwaita Konar, Natural Dyes - Dyeing of Textiles with Natural Dyes, Dr.Emriye Akcakoca Kumbasar (Ed.), InTech Publisher, New Delhi, 2011


David Pozo perez, Nanotechnology and Nanomaterials, InTech Publishers, NewDelhi, 2010

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 2 3 3</td>
<td>3 3 3 2 1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>2 3 3 3</td>
<td>2 2 2 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>1 2 1 4</td>
<td>3 3 1 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>1 2 6 6</td>
<td>3 1 2 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>3 2 2 3</td>
<td>6 1 2 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
- List out any four water quality parameters.
- Name the salts responsible for temporary hardness of water.
- Recall any two practical applications of green chemistry.
- Define wet oxidation in waste water treatment.
- State Pilling Bed-worth’s rule.
- Recall any two examples for differential aeration corrosion.
- Name any two natural dyes.
- Recall the role of auxochromes in dyes.
- Name the four methods of nanomaterial synthesis.
- Name any two plant extracts used in silver nanoparticles synthesis.
Understand
Hardness of water is always expressed in terms of CaCO3 equivalent. Reason out.
Soft water is not demineralized water whereas demineralized water is soft water - Justify.
Represent the need of green chemistry in waste water treatment.
Indicate the importance of MBR technology in waste water treatment.
Express the mechanism of wet corrosion.
Bolt and nut made from same metal is preferred in practice. Reason out.
Classify the types of natural dyes based on their chemical structure.
Compare the properties of metallic and non-metallic mordents.
Infer any two important needs of green chemistry in nanotechnology sector.
Identify the physicochemical and engineering properties of nanomaterials.

Apply
A sample of water contains 180 mgs of MgSO4 per litre. Calculate the hardness in terms of CaCO3 equivalents. (Molecular weight of MgSO4 is 120).
Calculate the non-carbonate hardness of a sample of water containing the dissolved salts as given below in mg/l Mg(HCO3)2 = 7.3; Ca(HCO3)2 = 40.5 and NaCl =50.
Select the scientific areas for the practical applications of green chemistry.
Predict the significance of sacrificial anode in the prevention of corrosion.
Outline the principle of electro-deposition to achieve copper coating on stainless steel object with a neat diagram.
Select a suitable technique used for the purification of natural dye.
Assess the role of Scanning Electron Microscope (SEM) in nano-materials characterization.

Analyse
Distinguish between scale and sludge.
Identify the four reasons for boiler troubles.
Differentiate between BOD and COD.
The rate of corrosion increases with increase in temperature. Give reason.
Outline the effect of pH of the conducting medium on corrosion.
Differentiate chromophores & auxochromes in dyes.

Evaluate
Substantiate the statement that nature of the environment affects corrosion.
Choose and explain any two best methods to synthesis nanoparticles.

Create
Plan and execute a method to get pure water from waste water using available low cost material in your area.
Relate the characteristic properties of natural with synthetic dyes.

PHYSICS ELECTIVES

15PH201 PHYSICS OF MATERIALS 3 0 2 4

Course Objectives
To understand the physical properties of conductors, semiconductors and superconductors
To recognize the basic principles of interaction of light with matter and working of optical devices
To classify the types of dielectric, magnetic materials and polarization mechanisms with their properties

Course Outcomes (COs)
Exemplify the physical properties of conductors, superconductors and semiconductors with applications
Identify the suitable semiconducting material for solar cell applications
Select the suitable materials for insulating and dielectric applications
Compare the optical properties of display devices
Analyze the properties of magnetic materials for practical applications
UNIT I
CONDUCTING AND SUPERCONDUCTING MATERIALS
9 Hours

UNIT II
SEMICONDUCTORS
10 Hours

UNIT III
DIELECTRIC MATERIALS
9 Hours
Types of polarization: electronic, ionic, orientation and space charge polarization mechanisms - Langevin-Debye equation - frequency and temperature effects on polarization - dielectric strength and loss -dielectric breakdown mechanisms - active dielectric materials: pizo, pyro and ferroelectric - applications.

UNIT IV
OPTICAL MATERIALS
9 Hours
Interaction of light with materials - optical absorption - transmission - Luminescence in solids - Fluorescence and Phosphorescence - Optical band gap - LED,LCD.

UNIT V
MAGNETIC MATERIALS
8 Hours
Classification and properties - domain theory - hard and soft magnetic materials - anti-ferro and ferri magnetic materials - applications: magnetic recording and memories.

FOR FURTHER READING
2 Hours
Photonic crystals - LIFI

INTRODUCTION
4 Hours
Exposure to Engineering Physics Laboratory and precautionary measures

EXPERIMENT 1
Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

EXPERIMENT 2
4 Hours
Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

EXPERIMENT 3
4 Hours
With the aid of travelling microscope, find the refractive index of a transparent solid and liquid material.

EXPERIMENT 4
4 Hours
Determine the wavelength of polychromatic source in the visible region using spectrometer.

EXPERIMENT 5
4 Hours
Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.
EXPERIMENT 6
Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

4 Hours

EXPERIMENT 7
Determine the V-I characteristics of a solar cell.

4 Hours

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 4 2</td>
<td>1 4 2</td>
<td>1 2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>2 2</td>
<td>2 4</td>
<td>5 3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>1 2 1</td>
<td>3 4</td>
<td>3 4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2 2</td>
<td>2 5</td>
<td>2 5</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>1 3</td>
<td>3 2 3</td>
<td>3 1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
State Meissner effect
List six properties of superconducting materials
Define photovoltaic effect
List the six common applications of dielectric materials
Retrieve optical absorption in metals
Reproduce the principle of LCD in display devices
Recall the term hysteresis in ferromagnetic materials
List four applications of magnetic materials
Recognize the need of optical band gap in differentiating the materials
Reproduce five applications of hard magnetic materials in day to day life

Understand
Explain the principle, construction and working of LED
Classify the three types of materials based on band gap energy
Interpret the working mechanism and characteristics of a solar cell
Illustrate Hall effect EXPERIMENT used to find the concentration of charge carriers in n-type semiconductors and hence explain the necessary theory
Summarize the various dielectric breakdown mechanisms observed in dielectric materials
Infer the principle involved in working of magnetic levitation
Classify the two types of luminescence in solids with appropriate energy level diagrams
Subsume the four types of polarization mechanisms involved in dielectric materials
Illustrate the V-I characteristics of a solar cell
Extrapolate the Clausius Mosotti equation for the dielectric material which is subjected to external electric field

Apply
Free electron density of aluminum is 18.10x10²⁸ m⁻³. Calculate its Fermi energy at 0K.
Planck’s constant and mass of free electron are 6.62x10⁻³⁴ Js and 9.1x10⁻³¹ Kg
Compute the relation between Remanence and Coercivity
Demonstrate the domain theory of ferromagnetism
Derive the expressions for electrical and thermal conductivity of metals and hence compute the Wiedemann Frantz law
Compute the carrier concentration in intrinsic and extrinsic semiconductors
Calculate the number of free electrons per unit volume in a metal in terms of Fermi energy
Assess the Magnetic levitation and SQUIDS in day to day life
Show the importance of dielectric breakdown mechanisms in dielectrics
Implement the applications of dielectric materials in real world problems
Compute the relation between polarization vector (P) and electric field (E)

Analyse
Differentiate Phosphorescence and Fluorescence
Can we increase the orientation polarization with increase in temperature? Justify
Justify the principle, construction, working, advantages and disadvantages of LCD
Compare hard and soft magnetic materials
Differentiate the ferromagnetic and anti-ferromagnetic materials with examples
Compare dia, para and ferromagnetic materials
Distinguish between polarization and polarizability
Differentiate elemental and compound semiconductors
Compare type I and type II superconductors
Compare LED and LCD

Course Objectives
To understand conducting, semiconducting, dielectric and magnetic properties of materials and exemplify their applications
To analyze the basic concepts of thermodynamics and heat transfer with illustrations
To gain knowledge about acoustical standards of buildings

Course Outcomes (COs)
differentiate the materials based on their properties and suit them for appropriate applications
select the suitable materials for insulating and dielectric applications
investigate the working mechanisms and efficiency of heat engines by applying the laws of thermodynamics
compare the different heat transfer mechanisms and its applications
choose the proper acoustic materials for the construction of buildings

UNIT I
11 Hours
CONDUCTORS AND SEMICONDUCTORS
Semiconductors: Elemental and compound semiconductors - intrinsic semiconductors - Fermi level and electrical conductivity - band gap energy - extrinsic semiconductors - n-type and p-type semiconductors: variation of Fermi level with temperature (qualitative) - Hall effect - applications.

UNIT II
DIELECTRIC AND MAGNETIC MATERIALS

UNIT III
THERMODYNAMICS

UNIT IV
HEAT TRANSFER

UNIT V
ACOUSTICS
Classification of sound based on frequency - characteristics of audible sound - reverberation time: Sabine's formula - determination of absorption coefficient - Erying's formula (qualitative). Sound insulation - sound absorbing materials - factors affecting the acoustics of building - remedies.

FOR FURTHER READING
Nanomaterials and its applications

INTRODUCTION
Exposure to Engineering Physics Laboratory and precautionary measures

EXPERIMENT 1
Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

EXPERIMENT 2
Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

EXPERIMENT 3
With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material

EXPERIMENT 4
Determine the wavelength of polychromatic source in the visible region using spectrometer.
EXPERIMENT 5
Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

4 Hours

EXPERIMENT 6
Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

4 Hours

EXPERIMENT 7
Determine the V-I characteristics of a solar cell.

4 Hours

Total: 75 Hours

Reference(s)
William D. Callister, Materials Science and Engineering an Introduction, John Wiley and Sons, Inc., 2010

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3 4</td>
<td>3</td>
<td>4 4</td>
<td>2</td>
<td>4</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>2 2</td>
<td>4 2</td>
<td>2 4</td>
<td>4</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2 2</td>
<td>4 2</td>
<td>4 2</td>
<td>2</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2 2</td>
<td>4 2</td>
<td>2 4</td>
<td>4</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>2 2</td>
<td>2 2</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
State Ohm’s law.
Define drift velocity.
List the two drawbacks of classical free electron theory.
State Wiedemann-Franz law.
Mention the practical unit used for electron’s magnetic moment.
Recall the term hysteresis in ferromagnetic materials.
List the four uses of magnetic materials.
State Zeroth law of thermodynamics.
State the Kelvin’s statement of second law of thermodynamics.
Name the three modes of heat transfer.
State Echelon effect.

Understand
Illustrate the significance of Fermi energy.
Why indirect gap semiconductors are preferred in fabricating transistors?
Classify the types of magnetic materials.
Outline the term retentivity and coercivity.
Compare dia, para and ferro magnetic materials.
Point out the ideal conditions required for diesel cycle.
Sketch the isothermal and adiabatic processes in P-V diagram.
Is it possible for a practical engine to have 100\% efficiency? Justify.
Ice kept in saw dust or wrapper in a blanket will not melt. Why?
Classify the types of sound waves.
Explain the three characteristics of musical sound.

**Apply**

The average energy of a conduction electron in copper at 300 K is 4.23 eV. Calculate the Fermi energy of copper at 300 K.
Determine the carrier concentration of p-type semiconductor whose hall coefficient is 3.66\times 10^{-4} m^3/C.
Compute the efficiency of Carnot’s engine operating between the temperatures 3270C and 270C.
Point out practical applications of heat conduction.
Compute the efficiency of Carnot’s engine working the steam point and the ice point.
Assess the reason for the formation ice on pond surface.
The intensity of sound produced by thunder is 0.1 Wm^-2. Calculate the intensity level in decibels.
Calculate Sabine’s mathematical relation for reverberation time of the hall.
Compute the minimum wavelength of audible sound at zero degree centigrade.

**Analyse**

Distinguish between relaxation time and collision time.
Differentiate between electrical and thermal conductivity.
List the various applications of soft and hard magnetic materials for day to day life.
Analysis the six properties of hard and soft magnetic materials.
If the system and surrounding are in thermal equilibrium, is it necessary they are in same state? Comment the statement.
Differentiate isothermal and adiabatic process.
Entropy remains constant in an adiabatic process. Justify the statement.
Compare Carnot’s cycle and diesel cycle.
Distinguish between loudness and intensity of sound.
Compare reverberation and echo.
How do you maintain optimum reverberation in a hall? Justify.

**15PH203 MATERIALS SCIENCE**

**Course Objectives**

To explain the properties of conducting, semiconducting and dielectric materials
To impart fundamental knowledge in optical materials
To understand the nature and applications of different magnetic materials

**Course Outcomes (COs)**

distinguish electrical properties of different kinds of conducting materials
identify the different types of semiconductors and its applications
categorize the various polarization mechanisms in dielectrics
choose the suitable material for the construction of display devices
select appropriate magnetic materials for magnetic storage devices
UNIT I
ELECTRICAL PROPERTIES OF METALS
Quantum free electron theory: Fermi-Dirac distribution function - Fermi energy and its variation with temperature - density of energy states - calculation of density of electrons and fermi energy at 0K - mean energy of electrons at 0K - problems.

UNIT II
SEMICONDUCTING MATERIALS

UNIT III
DIELECTRICS
Introduction - fundamental definitions in dielectrics - expressions for electronic and ionic polarizations - orientation polarization (qualitative) - space charge polarization - Langevin - Debye equation - frequency and temperature effects on polarization - internal field - expression for internal field (cubic structure) - Clausius-Mosotti equation and its importance - applications of dielectric materials - problems.

UNIT IV
OPTICAL MATERIALS

UNIT V
MAGNETIC MATERIALS
Introduction - orbital and spin magnetic moments - Bohr magneton - basic definitions - classification of magnetic materials - domain theory of ferromagnetism - process of domain magnetization - explanation of hysteresis curve based on domain theory - hard and soft magnetic materials.

FOR FURTHER READING
Optical data storage and Giant magnetoresistance

INTRODUCTION
Exposure to Engineering Physics Laboratory and precautionary measures

EXPERIMENT 1
Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.

EXPERIMENT 2
Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

EXPERIMENT 3
With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material.
EXPERIMENT 4
Determine the wavelength of polychromatic source in the visible region using spectrometer.

4 Hours

EXPERIMENT 5
Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

4 Hours

EXPERIMENT 6
Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

4 Hours

EXPERIMENT 7
Determine the V-I characteristics of a solar cell.

4 Hours

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 5 2</td>
<td>1 5 2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>2 2</td>
<td>2 3 2</td>
<td>5 2 4</td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>1 2 1</td>
<td>3 3 3</td>
<td>3 5 2</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2 3</td>
<td>3 3 2</td>
<td>2 5 2</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>1 3</td>
<td>3 2 5</td>
<td>3 1 2</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
Define density of electron energy states in metals.
Recall Fermi energy.
State Hall Effect.
List out the four advantages of semiconductors.
Define dielectric constant
Recall electric polarization.
Define Fluorescence.
Recognize hard and soft magnetic materials.
State the working principle of LED.
Define Bohr magnetron.
Understand
- Classify three types of free electron theory
- Represent the variation of Fermi level with temperature
- Explain Clausius-Mosotti relation
- Compare element and compound type semiconductors
- Illustrate the variation of Fermi level with temperature in n-type semiconductors
- Distinguish between a dielectric and insulator
- Mention the technique to increase the emission time in phosphorescence
- Exemplify hysteresis on the basis of domain theory of ferromagnetism
- Identify four examples for hard magnetic materials
- Identify four properties of ferromagnetic materials

Apply
- Compute the Fermi direct function for energy kT above the Fermi energy
- Assess the Fermi-Dirac distribution function
- Energy level of p-type and n-type semiconductors and justify the results
- Compute the carrier concentration of intrinsic semiconductors
- Explain the principle, construction and working of Hall Effect
- Show that electronic and ionic polarizabilities are independent of temperature
- Calculate the polarization of an atom above value five
- Differentiate the dia, para and ferromagnetic materials
- Compute the B-H Hysteresis curve on the basis of domain theory

Analyze
- Discriminate drift velocity and thermal velocity of an electron
- Difference between p-type and n-type semiconductors
- Obtain the expression for concentration of charge carriers in p-type semiconductor
- In practical dielectrics, the current does not exactly lead the voltage by 90°. Justify
- Local field is the space and time average of the electric field acting on a particular molecule
- Justify the result
- Justify the special features of magnetic blue ray disks
- Analyze the role of energies in the domain growth
- Explain the roll of activators in optical materials
- Describe the working of twisted pneumatic display device
- Compare LED and LCD

Course Objectives
To familiarize with the physical properties of materials
To gain practical applications of modern spectroscopy and microscopy techniques
To understand the preparation of bio and nanomaterials

Course Outcomes (COs)
- identify the electrical and thermal properties of conducting and semiconducting materials
- analyze the various polarization mechanisms in dielectrics
- choose specific materials for optical and magnetic data storage devices
- investigate the specimen with the aid of suitable spectroscopic techniques
- realize the methods adopted for preparing nano materials
UNIT I 10 Hours
CONDUCTING AND SEMICONDUCTING PROPERTIES
Quantum free electron theory - Fermi-Dirac distribution function - effect of temperature on Fermi function - density of energy states - calculation of density of electrons and Fermi energy at 0 K. Intrinsic semiconductors: expressions for density of electrons and holes - intrinsic carrier concentration - band gap energy. Extrinsic semiconductors: carrier concentration in n-type and p-type semiconductors - variation of Fermi level with temperature and impurity concentration - problems.

UNIT II 9 Hours
DIELECTRIC PROPERTIES

UNIT III 10 Hours
OPTICAL AND MAGNETIC PROPERTIES

UNIT IV 8 Hours
SPECTROSCOPY AND MICROSCOPY TECHNIQUES

UNIT V 8 Hours
BIO AND NANO MATERIALS

FOR FURTHER READING
Health and environmental impacts 2 Hours

INTRODUCTION
Exposure to Engineering Physics Laboratory and precautionary measures 4 Hours

EXPERIMENT 1
Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor. 4 Hours

EXPERIMENT 2
Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.
EXPERIMENT 3
With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material.

4 Hours

EXPERIMENT 4
Determine the wavelength of polychromatic source in the visible region using spectrometer.

4 Hours

EXPERIMENT 5
Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

4 Hours

EXPERIMENT 6
Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

4 Hours

EXPERIMENT 7
Determine the V-I characteristics of a solar cell.

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
Recall the merits of quantum free electron theory over classical free electron theory
Define carrier concentration
Recall Fermi energy
List the four types of polarization mechanisms.
Recognize polar and non-polar molecules
Define Bohr magneton
Recall coercivity and retentivity
Point out the four salient features of biomaterials
Define bioactive materials
State the working principle of FTIR spectroscopy

**Understand**
- Classify three types of materials based on bandgap energy
- Explain fermi-distribution function and effect of temperature on Fermi function
- Represent the variation of Fermi level with temperature
- Explain intrinsic and thermal breakdown mechanisms
- Infer the importance of Fermi level in a semiconductor
- Illustrate the phenomenon of B-H hysteresis on the basis of domain theory
- Classify four types of biomaterials
- Represent the scanning electron microscope to determine the grain size of the nanomaterials
- Explain the principle, construction and working of Scanning electron microscope
- Explain the principle and working mechanism of X-ray photoelectron spectroscopy (XPS)

**Apply**
- Find the variation of Fermi level with temperature and impurity concentration in n-type semiconductors
- Show that electronic and ionic polarizabilities are independent of temperature
- Show that the position of Fermi level is exactly at the midpoint of forbidden energy gap in intrinsic semiconductor
- Compute the relationship between polarizability and electric flux density.
- Assess the properties of dia, para and ferromagnetic materials
- Show that top down method is inferior to bottom up method
- Construct B-H Hysteresis curve on the basis of domain theory
- Design the principle, construction and working of chemical vapour deposition.
- Show that the electronic polarizability is directly proportional to the volume of an atom
- Compute the expression for carrier concentration in intrinsic semiconductors.

**Analyse**
- Extrinsic semiconductors possess high electrical conductivity than intrinsic semiconductors.
- Justify
- Silver is the best conductor of electricity. But gold is used in high-end electronic connectors.
- Justify.
- Identify the role of impurity concentration in the variation of Fermi level in the case of p-type semiconductors.
- Compare polar dielectrics with non-polar dielectrics.
- Analyse the features of hard and soft magnetic materials.
- Compare the six properties of dia, para and ferro magnetic materials
- Differentiate top down approach from bottom up approach.
- Select the four important features of TEM
- Justify the electronic polarizability of Argon is much greater than that of Helium.
- Intrinsic semiconductors are insulators at 0K. Justify.

**Course Objectives**
- To explain the properties of conducting, semiconducting and dielectric materials
- To understand the working mechanism of junction diodes
- To impart knowledge in optical and magnetic materials
Course Outcomes (COs)
identify different types of emission of electrons and significance of Fermi function
explore the carrier concentration and its variation with temperature of different semiconducting materials
analyze the I-V characteristics of a junction diode
investigate the various polarization mechanisms in dielectrics
select appropriate optical and magnetic materials for data storage devices

UNIT I
10 Hours
EMISSION PROPERTIES AND QUANTUM THEORY OF SOLIDS
Emission of electrons: types thermionic emission-principle- Richardson equation- secondary emission- principle- work function- Fermi-Dirac distribution function and its temperature dependence significance of Fermi energy- density of energy states- calculation of density of electrons and Fermi energy at 0K- average energy of electrons at 0K problems.

UNIT II
9 Hours
SEMICONDUCTOR PHYSICS

UNIT III
9 Hours
JUNCTION DIODE CHARACTERISTICS

UNIT IV
9 Hours
DIELECTRICS
Introduction: fundamental definitions in dielectrics - expressions for electronic and ionic polarizations - orientation polarization (qualitative) - space charge polarization - Langevin Debye equation - frequency and temperature effects on polarization - expression for internal field (cubic structure) - Clausius-Mosotti equation - dielectric loss - applications of dielectrics - problems.

UNIT V
8 Hours
OPTOELECTRONICS AND MAGNETIC MATERIALS

FOR FURTHER READING
Motion of an electron in uniform and non-uniform magnetic fields - electric and magnetic fields in a crossed configuration.

2 Hours

INTRODUCTION
Exposure to Engineering Physics Laboratory and precautionary measures

4 Hours

EXPERIMENT 1
Using Lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.
EXPERIMENT 2
Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.

4 Hours

EXPERIMENT 3
With the aid of traveling microscope, find the refractive index of a transparent solid and liquid material.

4 Hours

EXPERIMENT 4
Determine the wavelength of polychromatic source in the visible region using spectrometer.

4 Hours

EXPERIMENT 5
Based on Hall effect, calculate the charge carrier density of a given semiconductor and identify the nature of the semiconductor.

4 Hours

EXPERIMENT 6
Draw the B-H curve of a ferromagnetic material subjected to external magnetic field and hence identify the nature of the material.

4 Hours

EXPERIMENT 7
Determine the V-I characteristics of a solar cell.

4 Hours

Total: 75 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total: 100

Assessment Questions

Remember
Recall the Richardson equation.
Define dynamic resistance.
State the law of mass action.
Define Hall Effect.
List the three practical applications of p-n junction diode.
List the three practical applications of p-n junction diode.
List the four types of polarizations in dielectrics
Reproduce the expressions for electronic and ionic polarization.
State the working principle of LED.
Define retentivity and coercivity.

Understand

Explain the variation of Fermi-Dirac distribution function with temperature.
Indicate the importance of Fermi level.
Indicate the reason for preferring extrinsic semiconductors over intrinsic semiconductors.
Represent four applications of Hall Effect.
Represent the switching action of a diode.
Interpret the relation between polarization and polarisability in dielectrics.
All the dielectrics are insulators but all the insulators are not dielectrics. Illustrate with examples.
Interpret the relation between the dielectric constant and electric susceptibility.
Explain the phenomenon of electroluminescence in LED.
Summarize the working principle of giant magnetoresistance.

Apply

1. Find the expression for density of electrons and Fermi energy at 0 K.
2. Using the Fermi function, compute the temperature at which there is 1% probability that an electron in a solid will have energy 0.5 eV above EF of 5 eV.
3. Explain how phosphorous atoms donate electrons to the conduction band.
4. Apply the law of mass action to determine the carrier concentration of intrinsic semiconductors.
5. Construct a circuit using p-n junction diode and execute its V-I characteristics.
6. Construct a diode circuit with DC voltage source and demonstrate its working conditions.
7. Show that electronic polarizability is independent of temperature.
8. Explain frequency dependence of dielectrics with a neat sketch.
9. Apply the domain theory to the hysteresis effect observed in ferromagnetic materials.
10. Compute the wavelength of light emitted by an LED with band gap energy of 1.8 eV.

Analyse

The average energy of electrons at 0 K depends on Fermi level. Justify.
Differentiate p-type and n-type semiconductors.
Outline the working principle of full wave bridge rectifier.
At optical frequencies the total polarization is less. Justify.
Outline the causes for dielectric loss in dielectric materials.
Analyze the magnetic behavior of dia, para and ferromagnetic materials.
Compare the properties of LED and LCD.
Outline the difference between hard and soft magnetic materials.

Evaluate

Evaluate the resistance value using V-I characteristics of a p-n junction diode.
Evaluate the value of Fermi distribution function for an energy kT above the Fermi energy at that temperature and comment on the answer.
Course Objectives

- Provide fundamental concepts in software testing process.
- Learn various software testing issues and solutions in system testing.
- Understand how to plan a test project, design test cases and conduct testing operations.

Course Outcomes (COs)

- Apply software testing fundamentals and testing design strategies to enhance software quality.
- Design test cases for unit test, integration test, system test, regression and acceptance test.
- Manage test plan components, test measurements and reviews.
- Perform testing in software with various testing tools.

UNIT I
SOFTWARE TESTING FUNDAMENTALS
8 Hours


UNIT II
TESTING DESIGN STRATEGIES
10 Hours

Introduction to Testing Design Strategies - Black Box testing - Random Testing - Equivalence Class Partitioning - Boundary Value Analysis - Cause and error graphing and state transition testing - White-Box testing - Test Adequacy Criteria - Coverage and Control Flow Graphs - Covering Code Logic Paths - White-box Based Test design.

UNIT III
LEVELS OF TESTING
10 Hours

The Need for Levels of Testing - Unit Test - Unit Test Planning - Designing the Unit Tests - The Test Harness - Running the Unit tests and Recording results - Integration Tests - Designing Integration Tests - Integration Test Planning - System Test Types - System testing - Regression Testing - Alpha - Beta and Acceptance Test.

UNIT IV
TEST MANAGEMENT
8 Hours


UNIT V
TEST MEASUREMENTS AND REVIEWS
9 Hours

Defining Terms - Measurements and Milestones for Controlling and Monitoring - Status Meetings - Reports and Control Issues - Criteria for Test Completion - SCM - Types of reviews - developing a review program - Components of Review Plans - Reporting review results.
FOR FURTHER READING

Case study on Winrunner testing tool.

**Total: 45 Hours**

**Reference(s)**


**Assessment Pattern**

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>12</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

**Assessment Questions**

**Remember**

List out the phases involved in the software life cycle model.
Examine and present the information present in a test case.
Specify four metrics of Equivalence partitioning.
Classify the test adequacy criteria based on the test cases specified.
List out the errors that are uncovered by black box testing.
Classify the major activities associated with Software Configuration Management in Software testing and explain in detail.
A programmer using a mutation analysis tool finds that a total of 35 mutants have been generated for a program module A. Using a test set she has developed she finds after running the tests the number of dead mutants is 29 and number of equivalent mutants is 2.
 i) What is the mutation score for Module A? Is the test set for Module A adequate? ii) Illustrate the testing activities behind Control Flow Graph.
Differentiate between verification and validation.
List the sources of Defects or Origins of defects.
Define the term cyclomatic complexity.

**Understand**

Why is testing plan important for developing a repeatable and managed testing process?
Describe the principles involved in software testing.
Illustrate the defect classes with required example for each defect class.
Describe the two major assumptions of Mutation Testing.
Discuss in detail about evaluating Test Adequacy Criteria and axioms/properties provided by Weyuker.
Differentiate between object-oriented and procedural testing.
Is it possible to consider a method as a testable unit? Justify
Cost of quality increases as the system life cycle progresses. How? Explain with an example.
Can user participate in testing? Justify
Outline the need of test planning and illustrate the test plan components in software testing.
Apply

Analyze the importance of a tester to use both white and black box based testing techniques to evaluate a given software module.

Examine the role of Unit and Integration Testing in the phase of Software Testing.

For the following construct, describe the set of tests you would develop based on the number of loop iterations in accordance with the loop testing criteria.

```
for (i=0;i<50;i++)
{
    text_box[i] =value[i];
    full=full-1;
}
```

The module that has been devised by you has the following conditional statements: if (value<100 and found== true)
    
    call (enter_data (value))

else
    
    Print ("data cannot be entered")

calculate its cyclomatic complexity.

Develop the black box test cases using equivalence class portioning and boundary value analysis to test a module that is software component of an n ATM system. The module reads in the amount the user wishes to withdraw from his/her account. The amount must be a multiple of $5.00 and be less than or equal to $200.00. Be sure to list any assumptions you make and label equivalence classes and boundary values.

Draw a flow graph for the following code and calculate its cyclomatic complexity and justify how this value is useful to the tester?

```
Sum=0
Read (n) I=1
While (i<=n)
Read (number)
Sum+= number
number I=i+1
End while
Print (sum)
```

Develop a code for finding the sum of the square of n natural numbers and also find the types of defects that may occur in your coding and how it affects the system?

Consider that you are developing software which facilitates on-line shopping of television set from an online vendor. Design the set of tests you will use during system testing to evaluate the software.

A project manager estimates that the total costs of a project as Rs. 3,75,000. The project is a business application. There are security, performance and configuration requirements. The testers are experienced and have tool support and training. The number of test procedures is estimated at 670, with a ratio of 5.9 Hours/test procedure from the historical database of similar projects. Assume that the salary of the testers is Rs.37/hour. Estimate the costs of test for this project in as many ways as you can with the information given.

Apply the equivalence classes and boundary values and develop a set of test cases to cover them for the following module description: The module is part of a public TV membership system. The module allows entry of a contribution from $0.01 to $99,999.99. It also enters a member status for the contributor that can be: regular, student/retiree, or studio club

Analyse

Suppose you were reviewing a requirements document and noted a feature was described incompletely. How would you classify this defect? How would you insure that it was in corrected?
Suppose you are a member of a team that was designing a defect repository. What organizational approach would you suggest and why? What information do you think should be associated with each defect? Why is this information useful, and who would use it?

With Respect to principle 3-“test results should be meticulously inspected”-why do you think this is important to the tester?

According to Principle 5, relate the importance of test cases for both valid and invalid conditions.

Assume an online fast food restaurant system. The system reads customer orders, relays orders to the kitchen, calculates the customer’s bill and gives change. It also maintains inventory information. Each wait-person has a terminal. Only authorized wait persons and a system administrator can access the system.

Which type of tests would you perform for the software application described above?

For each type of test

Specify test objectives.

Give a general description of the tests you would develop and tools you would need.

You may make any assumptions related to the system characteristics what are needed to support your answers.

Programmer A and Programmer B are working on a group of interfacing modules and A tends to be a poor communicator. In this situation, what types of defects are likely to surface?

What is the role of testing tools in software field? How are tools selected and used?

Testing can detect only the presence of errors, not their absence. Why?

Differentiate verification and validation.

Evaluate

Find out the Cyclomatic complexity \( V(G) \) of the given flow graph.

Define the equivalence classes and boundary values to cover them for the following module description: The module is part of a public TV membership system. The module allows entry of a contribution from Rs.100 to Rs.10000. It also enters a member status for the contributor that can be: regular, student/retiree.

Create

Develop a use case to describe a user purchase of a laptop with credit card from an online vendor using web-based software. With use case, design a set of tests you would use during system test.

Create tables containing test data that will enable you to achieve (i) Simple Decision Coverage (ii) Condition Coverage (iii) decision /Condition Coverage.

15IT002 C# AND .NET

Course Objectives

Understand the concepts to develop window application and web application using .Net framework

Develop background knowledge as well as core expertise in C#

Course Outcomes (COs)

Use the development products of .Net framework to implement and connect to the enterprise applications

Display proficiency in Object Oriented tools when designing C# programs

Create web-based distributed applications using C#, ASP.NET, and ADO.NET
UNIT I 8 Hours
BASICS OF .NET AND C#
Relationship with the CLR - The CLR and .NET Framework.

UNIT II 10 Hours
C# AND OOP

UNIT III 9 Hours
INTERFACES

UNIT IV 9 Hours
WINDOWS FORMS
Forms and Controls - Windows Presentation Foundation Features - Architecture - Class Hierarchy - Application Model - Properties - WPF Events - Data Binding in Windows forms.

UNIT V 9 Hours
ASP.NET

FOR FURTHER READING
Case Study : File management with I/O

Total: 45 Hours

Reference(s)
Joseph Albahari and Ben Albahari, C# 5.0 in a Nutshell, Oreilly Media, 2012
Herbert Schildt, C# 4.0 The Complete Reference, Tata McGraw Hill, 2010

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>8</td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>8</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>4</td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
Give the benefits of .net Framework class Library.
List out any five classes under System namespace.
Discuss about the .NET namespaces and explain the unique features that will make the application more difficult to develop in other languages.

Name the Interfaces supported by Non generic Collection.

Give the syntax for the get and set accessor of attached properties.

List out the categories of controls supported in window based application and explain the importance of each.

List the two predefined reference types in C#.

Name the Controls in Windows presentation class.

Describe the architecture the .Net Framework and show the tools provided for managing the user- and application interfaces.

Define Common Language Runtime.

Understand

State the use of “new” keyword in inheritance concept.

Differentiate between Structure and Class in C#.

Mention the built in data source controls in ASP.NET provided by .NET Framework.

Compare the architecture of ADO with ADO.NET.

Explain the web Server architecture. What are the steps involved in the creation and consumption of web services. Explain with an example.

Discuss about the services provided by CLR to programs developed using C# with the important services the Framework Base class Library offer to the users.

Describe the visibility of class members declared with the following modifiers

   - Public
   - Private
   - Protected

Distinguish between WPF and WCF.

Difference between collection and Reflection.

How cts is used to implement OOP in C#?

Apply

Develop a C# code to declare a constructor for the time class that accepts a single argument, an object of type DateTime and initialize all the member variables based on values in that object.

Write a menu-driven application using C# with the following (i)File Menu option (ii) About Menu option.

Show the execution model using an example.

A company maintains two separate arrays containing the identification numbers and hourly wage rate of its employees. This information is maintained in increasing order of the employee number. Write a c# program for insertion and deletion of employee information.

Write a code to disable a windows form when a button is clicked.

Write a C# program to program that will accept a whole number as input and will print the number of each type of denomination it takes to equal the given input. Use the denominations 500, 100, 50, 20, 10, 5, 1.

Demonstrate a C# console application for converting the US dollars to Indian rupees for the each value entered by the user with the following

For statement 
do statement

Design a class name with the methods containing the following members Two integer data members minutes and Hours Two Constructors

Let’s consider a class which has Name and Property fields. The application should Produce the output as given below. You can Create a Property class and store the values as given below in an indexer and access the details of the property by giving the property code.

Analyze the problem and EXPERIMENT it using C# program.

Property #:920119
Condition: Excellent
Bedrooms:5
Bathrooms: 3
Market Value: 2,650
Find the Errors in the following code. Class emp : employee
{
    private string str public
    string firstname
    {
        get;
        {
            return str;
        }
        set;
        {
            str == value;
        }
    }
}

Calculate the age of a person in terms of years, months and days by using parameterized constructors and default constructors.

Analyse
Consider a bank application. Cheque clearing box is in process to clear 10 cheques per day. The Constraint is the Bank clerk can able to pass only local cheques on the same day and remaining cheques by the next day. Analyze the problem and write a C# program to address this problem in the bank application.

If an exception occurs then the program terminates abruptly without getting any chance to recover from the exception. As a programmer Illustrate the use of Exception handling with all mechanism to handle the errors and conclude by the use of CLR in this scenario.

Let’s consider an Employee class which has Name and JobGrade fields. I want to overload the comparison operators for this class so that it can participate in all types of comparison including <, <=, ==, >=, & !=. I want to translate the comparison in-between two Employee objects to be compared between the JobGrade. Since I do not want to write the comparison logic each time, typically I'd implement the comparison in one main method and from comparison operator overloading methods call this main method. Analyze the problem and experiment using C# program.

Create a class called Accounts which has data members like ACCOUNT no, Custome name, Account type, Transaction type (d/w), amount, balance. D->Deposit W->Withdrawal. If transaction type is deposit, call the credit(int amount) and update balance in this method. If transaction type is withdraw, call debit (int amt) and update balance. Pass the other information like Account no, name, Account Type through constructor. Call the show data method to display the values. Construct a class ThreeD which demonstrate to overload unary and binary operator along with an output.

Design a class name Time containing the following members Two integer data members minutes and Hours. Two overloaded Constructors. One method to display the class members.

Evaluate
Demonstrate the use of foreach loop to display the contents of a string array which contains name of ten varieties of food available in Hotel Called ParadiZeIn.

Write a C# program to convert the given four-digit number in words format like “One Nine Seven Eight”.

How will you create variable size array in c# program? Explain how it is different from a normal array.

Why do we need webform Authentication? Examine and give three security scenarios for web applications with ASP.net authentication types.
How does code behind model work in ASP.net which occurs during various stages of a system development life cycle? Analyze and give your explanation with an example during the Precompilation stage.

Create
Create a database application to display the details of student marks in a datagrid control. Write the database connection code using ADO.net with all connection string and adapter codes with packages.
Create a C# code to declare a constructor for the time class that accepts a single argument, an object of type DateTime and initialize all the member variables based on values in that object.

15IT003 SOFTWARE QUALITY MANAGEMENT 3 0 0 3

Course Objectives
Learn about various Software quality models
Gain knowledge about Quality measurement, implementation and documentation
Know about standards and certifications

Course Outcomes (COs)
Analyze the relations among software product, process and project in quality assurance and management
Design process and quality models for developing and assessing software products and processes;
Evaluate quality system standards for software products and processes.

UNIT I
INTRODUCTION

UNIT II
SOFTWARE QUALITY STANDARDS

UNIT III
SOFTWARE QUALITY INFRASTRUCTURE COMPONENTS
Procedures and Work Instructions - Supporting Quality Devices - Staff Training, Instructing and Certification - Preventive and Corrective Actions - Configuration Management - Documentation and Quality Records Controls.

UNIT IV
QUALITY CONTROL AND RELIABILITY
UNIT V  
QUALITY MANAGEMENT SYSTEM  
9 Hours

Elements of QMS - Rayleigh model framework - Reliability Growth models for QMS - Complexity metrics And model

FOR FURTHER READING
Gilbs approach- Documentation- Rayleigh model- Customer satisfaction analysis- CMMI- Six Sigma

Total: 45 Hours

Reference(s)
Mary Beth Chrissis, Mike Konrad and Sandra Shrum, CMMI for development, Pearson Education, 2011
E. Norman Fenton and James Bieman, Software Metrics, Taylor & Francis Group, 2010

Assessment Pattern

| Unit/RBT | Remember F | Remember C | Remember P | Understand F | Understand C | Understand P | Apply F | Apply C | Apply P | Analyse F | Analyse C | Analyse P | Evaluate F | Evaluate C | Evaluate P | Create F | Create C | Create P | Total |
|----------|------------|------------|------------|--------------|--------------|--------------|----------|----------|----------|------------|------------|------------|------------|------------|----------|------------|--------|----------|--------|-------|
| 1        | 5          | 5          | 3          | 3            | 3            | 3            | 3        | 3        | 3        | 3          | 3          | 3          | 3          | 3          | 3        | 3        | 22     |
| 2        | 5          | 5          | 3          | 3            | 3            | 3            | 3        | 3        | 3        | 3          | 3          | 3          | 3          | 3          | 3        | 3        | 19     |
| 3        | 5          | 5          | 4          | 4            | 4            | 4            | 4        | 4        | 4        | 4          | 4          | 4          | 4          | 4          | 4        | 4        | 14     |
| 4        | 6          | 4          | 6          | 4            | 4            | 4            | 4        | 4        | 4        | 4          | 4          | 4          | 4          | 4          | 4        | 4        | 25     |
| 5        | 9          | 5          | 5          | 3            | 3            | 3            | 3        | 3        | 3        | 3          | 3          | 3          | 3          | 3          | 3        | 3        | 20     |
| Total    | 30         | 30         | 30         | 30           | 30           | 30           | 30       | 30       | 30       | 30          | 30          | 30          | 30          | 30          | 30       | 30       | 100    |

Assessment Questions

Remember
What makes the QA work minimal?
What are the Characteristics of Software quality assurance?
What is software inspection?
What are the Ishikawa’s basic tools in software development?
Define Defect removal efficiency.
Define Jelinski Moranda model.
Define LittleWood model.
Define Goel Okumoto Nonhomogeneous Poison Process model(NHPP)
Define Musa-Okumoto Logarithmic Poison Execution Time model.
Define The Delayed S and Inflection S.
Define Lines of Code
Define Halstead’s Software Science.

Understand
Give the role of a project manager.
Define MTTF as a measure of reliability
What are the ways of killing the Quality Assurance?
What are reliability models?
What is Rayleigh mole?
Write down the advantages and disadvantages of survey methods
What are the survey methods of Customer satisfaction?
What are the key areas of guidance given by ISO 9000-3 standard?
What are the requirements of ISO9001?
What is the impact of ISO9000
What are the five levels of SEI CMM?
What is Defect Injection?
What are the activities associated with Defect injection and Removal?

Apply
1. How to apply Goel Okumoto imperfect debugging model.
2. How to use Cyclomatic Complexity for SQM.
3. Honeywell is the organization responsible with a specialized operating system and hundreds of user application programs, software acquisition, integration, testing and maintain quality assurance program. Construct Software Maintenance model by using Pareto Principle for organization by considering manpower and cost function.
4. Programmer A and Programmer B are working on a group of interfacing modules. Programmer A tends to be a poor communicator and does not get along well with the rules to create programming modules. Due this situation, what types of defects are likely to surface in these interfacing modules?
5. Implement the five effective methods to ensure the failure of software quality assurance?
6. George Wise is an exceptional programmer. Testing his software modules reveals very few errors, far fewer than the team’s average. He keeps his schedule promptly, and only rarely is he late in completing his task. He always finds original ways to solve programming difficulties, and uses an original, individual version of the coding style. He dislikes preparing the required documentation, and rarely does it according to the team’s templates. A day after completing a challenging task, on time, he was called to the office of the department’s chief software engineer. Instead of being praised for his accomplishments (as he expected), he was warned by the company’s chief software engineer that he would be fired unless he began to fully comply with the team’s coding and documentation instructions.
   Do you agree with the position taken by the department’s chief software engineer?
   If yes, could you suggest why his or her position was so decisive?
   Consider McCall’s model and the Deutsch and Willis model.
   What are the formal differences between the models?
   What are the content differences between the models?
   What new subjects were actually added by the Evans and Marciniak model to

The SCM Authority is expected to spend a significant part of its resources in carrying out software configuration audits.
List the main SQM audit tasks.
Give the contribution of each task to software quality.

CMM and CMMI are both composed of almost identical capability maturity models. While CMM bases its assessments on 18 key process areas, CMMI employs 24 process areas.
(a) Indicate which of the capability levels have been substantially changed.
(b) Can you characterize the observed changes?
The ISO and the IEC are neither capable of nor interested in carrying out certification audits. How are standards organizations assuring the performance of audits conducted with the same method and requiring the same level of achievement in the same subjects for organizations worldwide?

Analyse
Explain the differences between the CMM and CMMI process areas in relation to the respective subject matter.
Compare the 9000-3 requirements with the processes to be assessed according to 15504.
Discuss differences in subject matter as well as approach.
3. Compare CMM, Six Sigma and ISO

**Evaluate**
- Describe the general principles underlying quality management according to ISO 9000-3.
- Explain the benefits of the use of SQA standards.
- Explain the main contributions of checklists to software quality assurance.
- Explain the contribution of procedures to software quality assurance.
- Explain the contribution of CASE tools to the quality of software maintenance.
- Explain in detail about the Ishikawa’s basic tools in software development.
- Evaluate five methods suggested by waats for measuring quality.

**Create**
- Draw the Cause and effect diagram of Design Inspection.
- Suppose we have to develop software on Banking application processing system. The software should provide the features such as account creation, credit, debit, account transaction form online, present information available in the account holder offered by the bank and display the report of each transaction made by the customer. Prepare a work breakdown structure for the tasks to be performed and explain how you will develop the quality software product.

**15IT004 REAL TIME SYSTEMS**

**Course Objectives**
- Apply the knowledge of operating system concepts to understand real time system concepts like tasks and scheduling.
- Address the fundamental problems of real-time systems.
- Identify and assess the relevant literature and research trends of real-time systems.

**Course Outcomes (COs)**
- Apply the fundamental concepts and terminology of real-time systems.
- Understand the various protocols for effective resource sharing.
- Analyze the various parameters related to the different types of scheduling in single processor and multiprocessor environments.

**UNIT I**

**INTRODUCTION TO REAL TIME SYSTEMS**
Fundamentals of Real Time Systems-Characteristics of Real Time Systems-Safety and Reliability in Real Time Systems- Basic model of a Real Time System-Applications of Real time Systems-Types of Real time tasks-Timing constraint-Types and Modeling

**UNIT II**

**REAL TIME TASK SCHEDULING**
Task Scheduling-Basic concepts and Terminologies-Classification of Real Time Task Scheduling Algorithms-Clock Driven Scheduling-Table Driven Scheduling-Cyclic Schedulers-Hybrid Schedulers-Event Driven Scheduling-Earliest Deadline First (EDF) Scheduling-Rate Monotonic Algorithm (RMA) Scheduling
UNIT III
HANDLING RESOURCE SHARING AMONG REAL TIME TASK
9 Hours
Resource Sharing among Real Time Task-Priority Inversion-Priority Inheritance Protocol (PIP)-
Highest Locker Protocol (HLP)-Priority Ceiling Protocol (PCP)-Types of Priority Inversion under
PCP-PCP features- Issues in using a Resource Sharing Protocol

UNIT IV
REAL TIME OPERATING SYSTEMS (RTOS)
10 Hours
Scheduling Real time tasks in Multiprocessor and Distributed Systems-Multiprocessor Task
Allocation-Dynamic Allocation and Fault-tolerant Scheduling of Tasks-Clocks in Distributed Real
Time Systems-Real Time Operating Systems-Time Services and Features-UNIX as a Real Time
Operating Systems-Windows as a Real Time Operating System-POSIX and some other RTOS.

UNIT V
REAL TIME COMMUNICATION
9 Hours
Basic Concepts of Real Time Communication-Real Time Communication in a LAN- Soft and Hard Real
Time Communication in a LAN-Bounded Access Protocol for LAN- Real Time Communication over

FOR FURTHER READING
Basic Databases concepts-Real Time Databases-Characteristics of Real Time Databases -
Commercial Real Time Databases-Applications of Real Time Databases

Total: 45 Hours

Reference(s)
India, 2013.
Alan Burns and Andy Welling, Real-Time Systems and Programming Languages, Addison
Wesley long main, 2009.

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FCPM</td>
<td>FCPM</td>
<td>FCPM</td>
<td>FCPM</td>
<td>FCPM</td>
<td>FCPM</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td></td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>12</td>
<td></td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

Total 100

Assessment Questions
Remember
List the characteristics of Real Time Systems
Mention some applications of Real Time Systems
List some Real Time Task Scheduling Algorithms
Enumerate different type of Real time tasks
State the two approaches to achieve internal synchronization in Real time Systems
List the features of Real time operating systems.
Mention some applications of Real Time Communication.
Name any two important sensor and actuator devices used in real-time applications.
Illustrate UNIX and Windows as Real-time operating systems.
What is Lynx?

**Understand**
- Briefly explain about the model of Real Time Systems
- Describe how timing constraints can be modeled in Real time Systems
- Illustrate some issues in using RMA to practical situations
- Explain how PCP can be used for resource sharing among a set of tasks when the tasks are scheduled using EDF?
- Discuss two popular dynamic real-time allocation algorithms.
- Discuss the requirements of POSIX as Real Time Operating systems
- Explain the architecture of LAN use in Real time Communication.
- What do you understand by jitter associated with periodic tasks?
- What do you understand by the term “priority inversion” and “inherited priority inversion”? Describe the focused addressing and bidding and the buddy schemes for running a set of real time tasks in distributed systems.

**Apply**
1. Illustrate different timing constraints with an example of Telephone system.
2. Compare and contrast Earliest Deadline First (EDF) and Rate Monotonic Algorithm (RMA) Scheduling algorithm
3. Explain how PCP is able to avoid deadlock ,unbounded priority inversions, and chain blocking
4. Identify the key difference between hard real-time, soft real-time and firm real-time systems.
5. Explain using an example as to why critical resources can get corrupted if the task using it is preempted and another task is granted use of the resources.
6. What is the purpose of buddy algorithms in distributed environment?
7. What is a watchdog timer?
8. What problems arise if the system calls are indistinguishable from procedure calls?
9. Reason the difference between a self host and target host based embedded operating systems.
10. How global arbitration is achieved using virtual time protocol?

**Analyse**
- Is EDF really a dynamic priority scheduling algorithm ?Justify
- Is it possible to devise a resource sharing protocol which can guarantee that no task undergoes priority and unbounded priority inversion. Justify?
- Why is it necessary to synchronize the clocks in a distributed real-time systems
- Compare the two dynamic real-time allocation algorithms with respect to communication overhead and scheduling proficiency.
- Compare the advantages and disadvantages of using a ring network and collision based network for real-time communications.
- Explain the difference between traffic shaping and policing.
- Analyze the role of concurrency control protocol in a database.

**Evaluate**
- Examine the reasons of shortcomings of using UNIX as a Real Time Operating Systems.
- Give the rate at which the clocks need to be synchronized using a simple central time server method?
- Consider the use of timed token protocol (IEEE 802.4) in the following situation. We have four nodes in the system. The real-time requirement is that a node Ni be able to transmit up to bi Kbits over each period of duration Pi milliseconds, where bi and pi are given in the table below. Assume that the propagation time is negligible compared to TTRT and that the network bandwidth is 1 Mbps
Create
Construct an example involving three periodic real time tasks which would be schedulable under EDF but un-schedulable under RMA. Justify your answer
Suppose you are the manufacture of small embedded components used mainly in consumer goods such as automobiles, MP3 player etc. Would you prefer to use PSOS, WinCE or RT-Linux in your embedded component?

### Course Objectives
- Understand the scope, design and model of parallelism.
- Know the Characteristics, model and design of parallel algorithms.
- Solve a complex problem with message passing model and programming with MPI.
- Analyze complex problems with shared memory programming with openMP.

### Course Outcomes (COs)
- Understand the load balancing issues for parallel processing.
- Parallelize an existing application using appropriate programming paradigm.
- Develop and analyze a parallel algorithm using PRAM model.
- Analyze the speed up issues related to parallel processing.

### UNIT I
**INTRODUCTION TO PARALLEL PROCESSING**
- Motivation for Parallelism: Parallel Computing, Speed Up, Moores Law, Grand Challenge Problems, Trends; Parallel and Distributed Computers: Flynns Taxonomy, Distributed Memory Multicomputer, Shared Memory Multiprocessors

### UNIT II
**MESSAGE PASSING COMPUTING**
- Process Creation, Message Passing Routines, Point-to-Point, Collective Communication; MPI and PVM: MPIModel of Computation, Basic Concepts - MPI_Init, MPI_Comm_Size, MPI_Comm_rank, MPI_Send, MPI_Recv, Message Passing Routines, Point-to-Point, Collective Communication

### UNIT III
**PERFORMANCE MEASURES**
- Granularity, Speed Up, Efficiency, Cost, Amdahls Law, Gustafsons Law, and Isoefficiency; Analysis of Parallel Programs: Parallel Computation Models, PRAM, and Modeling Communication

### UNIT IV
**PARALLEL COMPUTATIONS**
- Low Level Image Processing, Mandelbrot Set, Monte Carlo Methods; Simple Data Partitioning: Sum of Numbers, Bucket Sort, Numerical Integartion, N-Body Problem; Divide-and-Conquer: Sum of Numbers, Merge Sort, Adaptive Quadrature, Barnes-Hut Algorithm; Pipelined Computations: Type 1, 2 and 3 Pipelines.
UNIT V
SCHEDULING AND LOAD BALANCING
List Scheduling, Static Load Balancing, Dynamic Load Balancing, Moores Algorithm Synchronous Computations, Data Parallel Programming, Global and Local Synchronization.

FOR FURTHER READING
Case Studies - Boundary Value Problem, finding the maximum n-body problem.

Total: 45 Hours

Reference(s)
Michael J. Quinn, Parallel Programming in C with MPI and OpenMP, McGraw Hill (2012).

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
</tr>
<tr>
<td>1</td>
<td>4 6 2 6</td>
<td>2 6 2 6</td>
<td>2 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
</tr>
<tr>
<td>2</td>
<td>4 6 2 6</td>
<td>2 6 2 6</td>
<td>2 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
</tr>
<tr>
<td>3</td>
<td>4 6 2 6</td>
<td>2 6 2 6</td>
<td>2 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
</tr>
<tr>
<td>4</td>
<td>4 6 2 6</td>
<td>2 6 2 6</td>
<td>2 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
</tr>
<tr>
<td>5</td>
<td>4 6 2 6</td>
<td>2 6 2 6</td>
<td>2 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
<td>4 6 2 6</td>
</tr>
</tbody>
</table>

Total 100

Assessment Questions

Remember
- Define Parallel Processing.
- Explain Pipelined processor in detail.
- List the Various parallel programming models.
- Explain loop splitting.
- What is Granularity?
- What is speedup?
- What is race condition?
- What is thread?
- Explain Parallel Reduction technique.
- Explain mutex

Understand
- Discuss classification of parallel computers.
- Explain Parallel algorithm for bubble sort.
- Discuss General Model Of Shared Memory Programming.
- Explain Parallel Sorting Algorithms.
- Explain Barriers in parallel computing.
- Explain forward dependency. Also explain how to overcome it.
- Explain Condition variable using pthread example.
What is speedup? Differentiate Ideal speedup v/s True speedup.
Explain basic parallel programming techniques.
Explain loop splitting with example.

Apply
What is Granularity? Explain effect of granularity on parallel processing
Classify parallel computers based on Flynn’s Taxonomy
Explain about RPC in detail and also explain normal procedure call v/s remote Procedure call
Give comparison of Temporal and Data parallel processing.
Why is a memory hierarchy needed?
Define anti dependence and output dependence with respect to parallelism and dependence relations.
In parallel computing, what are shared memory-multiprocessors and distributed-memory multicomputers?
What scalability metrics affect the scalability of a computer system for a given application?
Define any four scalability merits for an application.
What are macrotasking, microtasking and autotasking levels of multitasking employed for parallel execution on Cray X-MP or Y-MP multiprocessors?

Analyse
Explain advantages and disadvantages of parallel processing.
Compare explicit and implicit parallelism. Explain methods of explicit parallelism.
compare shared memory v/s Dynamic memory programming model.
Compare Dynamic memory model v/s Message passing model.
Discuss Analysis Of Parallel Algorithms
Enlist various types of parallelism and explain any one in detail also compare the types of parallelism.

Evaluate
Explain JAVA threads with Example
Explain about DCE Directory service and DCE Time service
Write about the support from operating system in multiprocessing. Also list and explain types of Operating system for parallel machine.
Give comparison of Temporal and Data parallel processing.
Give comparison of Temporal and Data parallel processing.

Create
Discuss how the instruction set, compiler technology. CPU implementation and control, cache and memory hierarchy affects CPU performance. Justify their effects in terms of program length, clock rate and effective cycles per instruction.
Design a pipe line multiplier to multiply a stream of input numbers X0, X2, X3.... by a fixed number Y. Assume all X’s and Y’s are 16 bit numbers. Draw a neat schematic diagram of your design

15IT006 BIG DATA ANALYTICS 3 0 0 3

Course Objectives
Learn advanced cutting edge and state-of-the-art knowledge and implementation in big data
Familiarize with mining data streams
Explore the next generation of big data tools and applications
Course Outcomes (COs)

Acquire the knowledge of big data, data science, data analytics, distributed file systems, parallel MapReduce paradigm, NoSQL, machine learning, etc.

Program and implement examples of big data and NoSQL applications using open source Hadoop, HDFS, MapReduce, Hive, Pig, Mahout, etc.

UNIT I

INTRODUCTION TO BIG DATA

UNIT II

DATA ANALYSIS

UNIT III

MINING DATA STREAMS

UNIT IV

FREQUENT ITEMSETS AND CLUSTERING
Mining Frequent Itemsets - Market Based Model - Apriori Algorithm - Handling Large Data Sets in Main Memory - Limited Pass Algorithm - Counting Frequent Itemsets in a Stream - Clustering Techniques - Hierarchical - K-Means Clustering High Dimensional Data - CLIQUE And PROCLUS - Frequent Pattern based Clustering Methods - Clustering in Non-Euclidean Space - Clustering for Streams and Parallelism

UNIT V

FRAMEWORKS AND VISUALIZATION
MapReduce - Hadoop, Hive, MapR - Sharding - NoSQL Databases - S3 - Hadoop Distributed File Systems - Visualizations - Visual Data Analysis Techniques - Interaction Techniques: Systems and Analytics Applications - Analytics using Statistical packages - Approaches to modeling in Analytics - correlation, regression, decision trees, classification, association - Intelligence from unstructured information - Text analytics - Understanding of emerging trends and technologies - Industry challenges and application of Analytics

FOR FURTHER READING
Applications of Big Data, Spark, Cassandra, MongoDB, Pig

Total: 45 Hours

Reference(s)

Glenn J Myatt, Making Sense of Data, John Wiley & Sons, 2007
Pete Warden, Big Data Glossary, O'Reilly, 2011.
Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, Second Edition, Elsevier, Reprinted 2008.

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>16</td>
<td>29</td>
<td>16</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

- Define the drivers for Big Data: Velocity, Variety, and Veracity.
- Write at least four Big Data Analytics Applications in detail.
- What technologies support Big Data analysis?
- What is the recommended best practice for managing big data analytics programs?
- What is the name of the programming framework originally developed by Google that supports the development of applications for processing large data sets in a distributed computing environment?
- What makes Big Data Analytics different from analysing a big database?
- What is the context for global and regional coordination by the official statistical community in the collection and dissemination of best practices in statistical information management for the scalable storage, mining and analysis of Big Data?
- Define Four V’s of Big Data
- What is Apache Hive?
- Define PIG.

Understand

- Explain Big data and Hadoop open source technologies.
- Write a brief note on composing map-reduce calculations.
- Explain about the Hadoop Input and Output and write a note on data integrity.
- Illustrate the design of Hadoop distributed file system (HDFS).
- Explain Massively Parallel Processing (MPP) Platforms architecture in detail.
- Define Unstructured Data Analytics. Elaborate on Context-Sensitive and Domain-Specific Searches.
- Explain Map-reduce framework in detail. Draw the architectural diagram for Physical Organization of Compute Nodes.
- Define HDFS. Explain HDFS in detail.
- What is Complexity Theory for Map-Reduce? What is Reducer Size and Replication Rate?
- Write Short notes on the following
  - Stream Data Model & Stream Queries
  - Graph Model and Mapping Schemas
  - Knowledge Hubs and Authorities
Is Big Data the tipping point to move from maintaining a proprietary database to processing in the Cloud?
How secure is a Cloud environment for storing confidential data?

Apply

1. How Big Data Analytics is Implemented? Expaln
2. An online retailer wants to study the purchase behaviors of its customers. What would be your recommendation to enhance the plot to detect more structures that otherwise might be missed?
3. Suppose everyone who visits a retail website gets one promotional offer or no promotion at all. We want to see if making a promotional offer makes a difference. What statistical method would you recommend for this analysis?
4. A local retailer has a database that stores 10,000 transactions of last summer. After analyzing the data,
a data science team has identified the following statistics:
{battery} appears in 6,000 transactions.
{sunscreen} appears in 5,000 transactions. {sandals} appears in 4,000 transactions. {bowls} appears in 2,000 transactions. {battery,sunscreen} appears in 1,500 transactions. {battery,sandals} appears in 1,000 transactions. {battery,bowls} appears in 250 transactions. {battery,sunscreen,sandals} appears in 600 transactions. Answer the following questions:
a. What are the support values of the preceding itemsets?
b. Assuming the minimum support is 0.05, which itemsets are considered frequent? c. What are the confidence values of \{battery\}→{sunscreen} and \{battery,sunscreen\}→{sandals}? Which of the two rules is more interesting?
d. List all the candidate rules that can be formed from the statistics. Which rules are considered interesting at the minimum confidence 0.25? Out of these interesting rules, which rule is considered the most useful (that is, least coincidental)?

Research and document additional use cases and actual implementations for Hadoop
Use MapReduce in Hadoop to perform a word count on the specified dataset.
Use Pig to perform a word count on the specified dataset
Use Hive to perform a word count on the specified dataset.
From a SQL table or query, randomly select 10% of the rows. Hint: Most SQL implementations have a random() function that provides a uniform random number between 0 and 1. Discuss possible reasons to randomly sample records from a SQL table.
As part of operationalizing an analytics project, which deliverable would you expect to provide to a Business Intelligence analyst?

Analyse

Are statistical offices in developing countries able to leapfrog the modernization of statistical products and processes in a contractual services environment while working with advanced statistical offices in meeting the new challenges in Big Data?
How do we introduce a change in the official statistical community at global, regional and national level to rethink and to innovate our statistical products and processes for official statistics with the advent of Big Data?
Analyze the key skill sets and behavioral characteristics of a data scientist.
In which phase would the team expect to invest most of the project time? Why? Where would the team expect to spend the least time?
What are the benefits of doing a pilot program before a full-scale rollout of a new analytical methodology?
Discuss this in the context of the mini case study.
If a graph of data is skewed and all the data is positive, what mathematical technique may be used to help detect structures that might otherwise be overlooked?

Compare and contrast five clustering algorithms, assigned by the instructor or selected by the student

Compare and contrast Hadoop, Pig, Hive, and HBase. List strengths and weaknesses of each tool set.

Research and summarize three published use cases for each tool set.

Describe four common deliverables for an analytics project.

Justify Differentiate BI and Data Science

Create

Why it is better to have a big database for data mining?

If your company is just starting to consider using Big Data in marketing research, what would be most useful to include?

15IT007 DISASTER MANAGEMENT 3003

Course Objectives

Understand the Principles and Components of Disaster Management in IT Infrastructure.

Learn the Design Considerations when Planning for Business Continuity and Disaster Recovery.

Study the VM Business Continuity and Disaster Recovery Solutions.

Course Outcomes (COs)

1. Analyze the various methods to mitigate the effect due to disasters.

2. Create the Virtual Infrastructure with replication technique.

3. Provide the Network Infrastructure Solutions for BC.

UNIT I 9 Hours

DISASTER MANAGEMENT AND PLANNING


UNIT II 9 Hours

DISASTER MANAGEMENT CYCLE

Disaster Mitigation, Risk reduction, Prevention, Preparedness, Response, Recovery - Importance of Information and Communication in Disaster Mitigation, Hazard mapping and forecasting, Strengthening Capacity for Reducing Risk, Role of Team and Coordination, Sustainable Development for Disaster Mitigation.

UNIT III 9 Hours

IT BUSINESS CONTINUITY AND DISASTER RECOVERY

Typical BCDR planning workflow process - Design Considerations when Planning for BCDR: Network Address Space, Datacenter Connectivity, Storage Infrastructure, VirtualCenter Infrastructure, VMware ESX Host Infrastructure - Virtual Machines as a Foundation for BCDR: Virtual Infrastructure, Virtualization Platforms, Leveraging Virtual Infrastructure for BCDR.
UNIT IV
DESIGN AND IMPLEMENTATION BCDR SOLUTION
High-Level Design Considerations - Typical Configuration: Granularity of failover, Replication, Resource management, Namespace mapping, VI Networking - VM BCDR Solution: Design Considerations, VirtualCenter Design, Protection Groups and VirtualCenter.

UNIT V
ADVANCED AND ALTERNATIVE BCDR SOLUTIONS

FOR FURTHER READING
Sahana Disaster Management System, Tsunami Early Warning System, UNOSAT’s Role in Disaster Response,

Total: 45 Hours

Reference(s)
Dr. Mralini Pandey Disaster Management, wiley india Pvt Ltd 2014
Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.
National Policy on Disaster Management, NDMA, New Delhi, 2009.
A Practical Guide to Business Continuity and Disaster Recovery with VMware Infrastructure, VM Books - VMware, Inc.

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 2 2 1</td>
<td>1 2 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>2 1 3 2</td>
<td>2 2 2 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>4 2 4 2</td>
<td>4 2 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2 2 2 4</td>
<td>4 3 4 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>1 2 4 4</td>
<td>4 2 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>F C P M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
List 2 types of Disasters.
Define the term Anthropogenic Disasters.
Name the 6 components of disaster management cycle.
Define Network Address Space.
list the advantages of Hazard mapping.
Name the 2 types of Replication techniques.
What is the use of dynamic IP in computer networks?
List 4 advantages of VMware ESX Hosts.
Define SAN Zoning.
What is Storage Multipathing?
Understand

Explain the concepts of Natural and Anthropogenic Disasters.
Explain in detail about the different Components of Disaster Management.
Sketch and explain the components of disaster management cycle.
What was the main Role of Team and Coordination in DS?
Classify the components of Virtual Center Infrastructure.
Explain the 3 types of storage techniques in Datacenter.
Give an example for Storage Virtualization at Different Layers.
Describe the network visualization techniques in Datacenter.
Summarize the concept of block level virtualization technique.
Explain the various virtualization methods along with their benefits and considerations.

Apply

1. can you do the Vulnerability Analysis in DS?
2. Cloud architectures designed for service delivery and availability of services are extremely important. How do you handle the software failure within a cloud infrastructure environment using virtualization techniques?
3. A company is considering a cloud environment to improve the operating efficiency for their data and applications. The company is part of an industry where strict security and data privacy issues are of the highest importance. Illustrate how the virtual datacenter offers data security.
4. Draw the working flow of remote replication in cloud.
5. A company is setting up a cloud environment to host several of their applications. These applications vary in importance and the company wants to ensure that the most business critical applications get the most resource. Show the benefits of VMware BCDR for this company.
6. Illustrate the 2 traditional approaches for taking backup in VDC.
7. Show the procedure to restore the backup data in a virtual machine?
8. Illustrate the steps involved in SAN Zoning process in BCDR.
9. Draw the Storage Multipath architecture for alternative BCDR solutions.
10. Illustrate the concept of VMware ESX Host Infrastructure.

Analyse

Compare and contrast the Fixed IP Addresses and Changing IP Addresses.
Classify the two types of Disaster.
What are the pros and cons of SWOT Analysis?
Differentiate between RTO and RPO in Datacenter management.
Do you use a third-party datacenter (rented space) or a dedicated facility that you own and operate?
Classify the data centers according to the applications. With a line sketch and a suitable application example, explain the features of each type.
Differentiate between local replication and remote replication.
Differentiate between service failover and failback.

Evaluate

What level of granularity are you looking to achieve in a disaster situation?
Is there a better solution to broadcast the Disaster messages in ICT?

Create

A software concern would like to leverage cloud computing to provide advanced collaboration services (i.e. video, chat, and web conferences) for its employees but does not have the IT resources to deploy such an infrastructure. Design a virtual network infrastructure for this company.
Design an efficient Disaster Mitigation system for Software Company.
15IT008 MANAGEMENT INFORMATION SYSTEMS

Course Objectives
Bring a systematic knowledge of the management information technology.
Analyze the concepts which are used in information systems to make the Graduates effective
Analyze the knowledge on effective application of information systems in business

Course Outcomes (COs)
Understand the importance of information , organizational and decision making in business
Analyze the role of the major types of information systems in a business environment and their relationship to each other
Assess the impact of the Internet technology on business-electronic commerce and electronic business

UNIT I
9 Hours
INFORMATION SYSTEM AND ORGANIZATION
Matching the Information System Plan to the Organizational Strategic Plan-Identifying Key Organizational Objective and Processes and Developing an Information System Development- Technology of Information Systems- Concepts- Definition - Role and impact of MIS - Role and importance of management- Approaches to Management - Functions of the manager - Management as a control system

UNIT II
9 Hours
DECISION MAKING AND INFORMATION
Decision making concepts - Methods- Tools and Procedures - Behavioral concepts in Decision making - Organizational Decision Making - Information concepts as a quality Product - Classification of the information - Methods of Data and information Collection - Value of the information - Human as a information Processor - Organization and Information.

UNIT III
9 Hours
SYSTEM ANALYSIS AND DESIGN

UNIT IV
9 Hours
DECISION SUPPORT SYSTEMS

UNIT V
9 Hours
CURRENT TRENDS
Knowledge management - Networks - Internet and Web based Information System - Electronic Commerce - Electronic Business - Commercial applications
FOR FURTHER READING
Management by exception- Organization structure and Theory System concepts Control Types - Handling System Complexity

Reference(s)
www.Gisdevelopment.net/policy/gii/gii0022b.html
http://catalogs.mhhe.com/mhhe/viewProductDetails.do isbn=0072456655

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td></td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td></td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
<td>7</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>4</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
- Define MIS
- Elicit the characteristics of control process
- Using examples compare and contrast expert system and DSS
- Explain the methods used for designing structured programs
- Illustrate the merits and demerits of System audit
- Describe THREE levels of management and explain the differing information requirements at each level.
- Describe knowledge-based systems and explain how such systems could be implemented.
- Explain how the knowledge-based system should be tested
- Elucidate the main features of a workflow system.

Understand
- What do you mean by Structural methodologies
- Describe the necessity of information in the management of organizations
- Name and describe the principle controls for a computerized systems
- For EACH of the following MIS development approaches, provide an overview of the approach and explain to which MIS development situations the approach is most suited.
  - Traditional approach.
  - Evolutionary approach.
  - Phased approach.
- For EACH of the following MIS development approaches, provide an overview of the approach and explain to which MIS development situations the approach is most suited.
Traditional approach.
Evolutionary approach.
Phased approach.

Explain, with the aid of suitable examples, the role of a digital dashboard in supporting management control activities.

Service Sector is also called ************

Describe and justify THREE characteristics of quality management information

Scalability is a key issue to consider within BI systems development - Explain

Discuss the prerequisites of successful end-user computing and comment on how the success of such systems could be measured

**Apply**

With the aid of suitable examples, describe the ways in which the Internet can enable MIS provision.

Illustrate the various MIS technologies that could be used to create a virtual organisation.

Illustrate the advantages and disadvantages of a manager being the direct user of an OLAP tool rather than providing an intermediary to operate the OLAP tool on behalf of the manager.

A food producing company wants to make different decisions regarding the production process whenever these are required. Specifically, they want to be able to effectively answer questions such as “If one of the production process machines breaks down, what is the effect on the company’s ability to satisfy customer demand for our products?” and “If we add an additional shift to our daily work schedule on one of our production process machines, what impact would this have on our throughput per day?”

Critically analyse both the traditional and the Rapid Application Development (RAD) approaches to the development of Management Information Systems.

Discuss and justify which of the development approaches, traditional or RAD you would recommend for following situation:

An insurance company which requires an accounting system to process and record the collection of premiums obtained from customers’ bank accounts.

“Wearable technology will have as big an impact on Management Information Systems as did the introduction of the personal computer.”

Develop a MIS for a manufacturing organization indicating the different types of information subsystems depending on functional areas. Highlight the flow of information and the corresponding levels of information. What are the types of reports the system would generate.

Why Cost Benefit Analysis is carried out?

Why Quality Control is necessary in Information System Design?

**Analyse**

How Decision Support System will help MIS Manager in the cost benefit analysis system

"Structural analysis is an important step and a vital role for system analysis". Highlights its impact on the outcome of cost / benefit analysis.

Give an examples of how information systems can support the five functions of management

Which one of the following is not an important characteristic of useful and effective information?

The most important reason for failure of MIS is ************

The finance manager of a local company wishes to develop his own spreadsheet-based Decision Support System (DSS) that will help determine the financial feasibility of any potential project the organisation is considering. Discuss the benefits and potential problems that might arise as a result of the DSS being developed by the finance manager.

The company’s auditors have concerns that information held by the virtual company would lack security. List and describe FIVE measures that could be adopted to ensure this information remains secure.

Using examples, explain how a combination of document management systems and workflow systems could improve productivity in the large organisation.
The involvement of user staff and MIS staff in all the development stages, from initial system request to post implementation review is required - JUSTIFY

Evaluate
In the context of MIS, describe each of the following applications and evaluate their benefits.
- Data warehousing
- Customer Relationships Management (CRM) systems
- Enterprise Resource Planning (ERP) systems

Create
"An analyst must possess various skills to effectively carry out the job". Elucidate the statement from the viewpoint of skills required for the system analyst.

Paradigm shift to pervasive computing is likely to create new opportunities and challenges for information technologies – Discuss

15IT009 NATURAL LANGUAGE PROCESSING 3 0 0 3

Course Objectives
understand the representation and processing of Morphology and Part-of Speech Taggers
express different aspects of natural language syntax and the various methods used for processing syntax
know about various applications of natural language processing

Course Outcomes (COs)
Identify the different linguistic components of given sentences
Design a morphological analyser for a language using finite state automata concepts
Implement a parser by providing suitable grammar and words

UNIT I 8 Hours
INTRODUCTION

UNIT II 9 Hours
MORPHOLOGY AND PART OF SPEECH TAGGING

UNIT III 10 Hours
SYNTAX PARSING
Syntax Parsing - Grammar formalisms and treebanks - Parsing with Context Free Grammars - Features and Unification - Statistical parsing and probabilistic CFGs (PCFGs)- Lexicalized PCFGs.

UNIT IV 10 Hours
SEMANTIC ANALYSIS
UNIT V
APPLICATIONS
Named entity recognition and relation extraction - Information Extraction (IE) using sequence in labeling - Machine Translation (MT) - Basic issues MT - Statistical translation - word alignment - phrase-based translation - Question Answering

FOR FURTHER READING
Document Classification Text Search.

Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 2 2 2</td>
<td>2 12 2 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>2 2 2 2</td>
<td>2 12 2 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>2 2 2 2</td>
<td>2 12 2 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>2 2 2 2</td>
<td>2 12 2 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>2 2 2 2</td>
<td>2 12 2 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td>2 12 2</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
- Provide two examples of lexical gaps relative to language pairs of your choice.
- Give four examples each of transitive verbs and intransitive verbs.
- State an algebraic definition of PS-grammar.
- Name two different reasons why an LA-parser may stop the analysis before reaching the end of the input.
- By which method is the proper inclusion of the type-3 language class in the type-2 language class and that of the type-2 language class in the type-0 language class formally proven in PS-grammar?
- Give the inflectional paradigms of man, power, learn, give, fast and good. Generate new words from them (derivation) and combine them into meaningful new words (composition).
- Describe the LA-derivations of "John gave Mary Susy, the boy gave the mother the child, and the big boy gave the young mother the hungry child", and give detailed explanations of the pattern matching and the categorical operations of the rules involved.
- Define speech processing and language processing.
- State the term regular expression?
- Define transformation-based tagging.

Understand
- Explain the procedure to construct the context free grammar and parse tree for the English language.
- Illustrate finite state morphological parsing for the following sentence “The Porter algorithm is a simple and efficient way to do stemming, stripping off affixes.”
Discuss the Information retrieval and word sense disambiguation process for the Airline corpus.
Describe how Yarowsky's algorithm for word sense disambiguation would process the example texts. Illustrate each stage of the algorithm with an example.
In what sense is the interaction with a contemporary washing machine a special case of man-machine communication, and why is it not essential to computational linguistics?
It is sometimes pointed out that English has no word corresponding to the German word Schadenfreude. Does this mean in your opinion that the corresponding concept is alien to speakers of English and cannot be expressed?
Rather than simply parsing a sequence of words, if interfacing a parser to a speech recognizer, one often wants to be able to parse a word lattice. Extend a PCFG parser so it works with word lattices.
Explain the relation between special types of PS-grammar, formal language classes and different degrees of complexity.
Demonstrate with an example that the derivation order to PS-grammar is incompatible with the time-linear structure of natural language.
Do left-associative combi-rules show a difference in the combination of a prefix and a stem, on the one hand, and a word start and a suffix, on the other? Illustrate your answer with the example un/du/ly.

Apply
Write a program that takes a word and using an on-line dictionary, computes possible anagrams of the word.
Design the Transformation Based Learning algorithm. Create a small number of templates and train the tagger on any Part of Speech tagged training set you can find.
Using the list approach to representing a verb's sub categorization frame, show how a grammar could handle any number of verb sub categorization frames with only the following VP rules. More specifically, show the constraints that would have to be added to these rules to make this work

\[
\begin{align*}
\text{VP} & \rightarrow \text{Verb} \\
\text{VP} & \rightarrow \text{VP X}
\end{align*}
\]
Implement the PARSEVAL metrics, use either treebank or create your own hand checked parsed testset. Use your Context Free Grammar parser and grammar and parse the testset and compute labeled recall, labeled precision, and cross-brackets.
Using a phrasal search on your favorite web search engine, collect a small corpus of the tip of the iceberg examples. Be certain that you search for an appropriate range of examples.
Implement and analyze using Earley-based semantic analyzer.
The following context-free grammar (CFG) accepts sequences of part-of-speech categories (e.g., Det N, Adj Adj N). With a lexicon, as shown, it can be used to parse some English noun phrases (NPs).

\[
\begin{align*}
\text{Start symbol: NP} & \rightarrow \text{Det NP} \\
\text{Det N} & \rightarrow \text{dog, dogs, house,} \\
\text{N} & \rightarrow \text{houses, model, models} \\
\text{Adj N} & \rightarrow \text{brown, red, model} \\
\text{PP} & \rightarrow \text{in, under, N PP} \\
\text{P} & \rightarrow \text{P NP}
\end{align*}
\]
Give a non-deterministic finite-state automaton (NDFSA) which accepts the same sequences of part-of-speech categories as this CFG. Explain the notation that you use.
Write a regular expression that will identify male and female names in context, in an English-language text. Discuss ways in which this might over- or under-generate.
How will you create the actual algorithm for HMM tagging?
Demonstrate with an example for parsing with unification constraints.
How to tell if a language is not regular? Explain a machine with N states accepting a string xyz of N symbols.
Analyse

Compare three different approaches to language analysis and describe their different methods, goals, and applications.

Compare the description of natural visual pattern recognition with electronic models. Bring out differences on the level of hardware and common properties on the logical level between the two types of system.

Differentiate between non-deterministic finite-state automaton and deterministic finite-state automaton.

Explain the difference between regular and context-free grammars and discuss the claim that natural language grammars need at least context-free power.

Suppose the following lists show the number of sentences and the most commonly occurring part-of-speech tags in three different categories of text in a corpus, with their frequency of occurrence in brackets. What can you say about the styles of these documents from studying these results? Discuss any assumptions you make.

Evaluate

Consider a domain where the word coffee can refer to the following concepts in a knowledge-base: a caffeinated or decaffeinated beverage, ground coffee used to make either kind of beverage, or the beans themselves. Give arguments as to which of the following uses of coffee are ambiguous and which are vague.

I’ve had my coffee for today.
Buy some coffee on your way home.
Please grind some more coffee.

Select a restricted sublanguage and build either a systemic or FUF generation grammar for it. The sublanguage should be subset of a restricted domain such as weather reports, instructions, or responses to simple inquires.

Show that the KL divergence is not symmetric by finding an example of two distributions p and q for which \( D(p \parallel q) + D(q \parallel p) \).

Esperanto is an artificial language that was invented by Ludwig Zamenhof in 1887. It was designed to be easy to learn and is based largely on the languages of western Europe. It is now primarily spoken in France, although it may also be found in eastern Asia, South America and eastern Europe. There are now between 200-2,000 native speakers and about 2,000,000 people worldwide speak it as a second language. Examine the following data from Esperanto and then answer the questions below:

1. bono ‘goodness’
2. instrua ‘instructive’
3. malfacila ‘difficult’
4. patrino ‘mother’
5. instruisto ‘teacher’
6. porti ‘to carry’
7. facila ‘easy’
8. patro ‘father’
9. portisto ‘porter’
10. instrui ‘to instruct’

Apply the n-gram and Brill tagging methods to IOB chunk tagging. Instead of assigning POS tags to words, here we will assign IOB tags to the POS tags. E.g., if the tag DT (determiner) often occurs at the start of a chunk, it will be tagged B (begin). Evaluate the performance of these chunking methods relative to the regular expression chunking methods covered in this chapter.

Create

For each word below, draw a word tree.

shipper
disobey
resettled
anticlimaxes
unemployment
Course Objectives

Study the fundamentals of Image and transforms for performing image processing.

Apply the techniques of image enhancement, restoration and colour models.

Understand the methods of image compression and segmentation.

Course Outcomes (COs)

Understand the properties of image transforms and use them in for image processing applications including enhancement and compression.

Understand the theoretical aspects of image restoration, color models and segmentation and design appropriate solutions.

Design and implement image compression and segmentation algorithms.

UNIT I 9 Hours

IMAGE TRANSFORMS

Components of an Image Processing - Image sampling and quantization - Relationship between pixels: neighbours, Adjacency, connectivity, Regions and boundaries, Distance measures, Image Transforms: Discrete Fourier Transform (DFT) - Discrete Cosine Transform (DCT) - Karhunen-Loeve transform (KLT) - Singular Value Decomposition (SVD) - Walsh transform - Hadamard Transform and Harr Transform

UNIT II 9 Hours

IMAGE ENHANCEMENT


UNIT III 9 Hours

IMAGE RESTORATION AND COLOR MODELS

Model of Image Degradation/restoration process - Noise models - Inverse filtering - Least mean square error (Wiener) filtering, Constrained least mean square filtering - Color fundamental, RGB colour Model, CMY and CMYK Colour Models, HIS colour model, YIQ Colour Model, YCbCr Colour Model, Pseudocolor Image processing-Intensity Slicing, Intensity to Colour Transformation.
UNIT IV
IMAGE COMPRESSION TECHNIQUES
9 Hours
Need for Image Compression - Redundancy - spatial and temporal redundancy - Classification of image-compression Schemes - Huffman Coding, LZW coding, Run Length coding, BIT plane coding, predictive coding, Image compression standards - Transform based Compression:JPEG

UNIT V
IMAGE SEGMENTATION
9 Hours
Segmentation Fundamentals-point, line, and edge detection, The Marr-Hilderth edge detector, Canny edge detector, Region Based segmentation - region growing, region splitting and merging. Boundary representation: chain codes - Polygonal approximation - boundary descriptors: Simple descriptors-Regional

FOR FURTHER READING
Face and Finger print recognition systems based on feature extraction using supervised neural network
Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 4 2 6</td>
<td>2 6 2</td>
<td>2 2</td>
<td>2 6 2</td>
<td>2 4 2</td>
<td>2 2</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>2 2 6</td>
<td>2 2 6</td>
<td>2 8</td>
<td>2 6 2</td>
<td>2 4 2</td>
<td>2 2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2 2 4</td>
<td>2 4 2</td>
<td>2 6</td>
<td>2 6 2</td>
<td>2 4 2</td>
<td>2 2</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2 2 6</td>
<td>2 4 2</td>
<td>2 6</td>
<td>2 6 2</td>
<td>2 4 2</td>
<td>2 2</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>2 4 2</td>
<td>2 4 2</td>
<td>2 6</td>
<td>2 6 2</td>
<td>2 4 2</td>
<td>2 2</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
State the meaning of gray level in Digital Image Processing.
List the steps involved in Digital Image Processing.
Write the properties of KL transform.
List the three geometric transformation
State the properties of unitary transform
Give two properties of SVD transform
List the three applications of transform
Define image subtraction
What is meant by masking?
10. What is maximum filter and minimum filter?

**Understand**
- Explain Hadamard transformation in detail.
- Explain in detail the different separable transforms.
- Explain Fast Fourier Transform (FFT) in detail.
- Discuss the properties and applications of 1) Hadamard transform II) Discrete Cosine Transforms.
- Explain Haar and slash transform in detail.
- Discuss the image smoothing filter with its model in the spatial domain.
- Explain image enhancement in the frequency domain.
- Discuss about Constrained Least square restoration for a digital image in detail.
- Explain image degradation model /restoration process in detail.
- Explain the schematics of image compression standard JPEG.

**Apply**
1. Calculate the number of bits required to store a 256 X 256 image with 32 gray levels.
2. Compare spatial and frequency Domain methods.
3. Perform KL transform for the following Matrix.
   \[
   X = \begin{bmatrix}
   4 & -2 & -1 & 3 \\
   
   \end{bmatrix}
   \]
4. Find a singular value decomposition of \( A = \begin{bmatrix}
   1 & -2 & 3 & 2 & -1 \\
   \end{bmatrix} \)
5. Compute the 2D Haar transform of the signal \( f(m,n) = \begin{bmatrix}
   4 & -1 & 2 & 3 \\
   \end{bmatrix} \)
6. Determine whether the matrix \( A = \frac{1}{\sqrt{2}} \begin{bmatrix}
   1 & 0 \\
   -1 & 1 \\
   \end{bmatrix} \) is unitary or not.
7. Develop a MATLAB program to extract extract the 8th bit in the 8 bit image using bit plane slicing.
8. Write a MATLAB program that performs a 2D butterworth low pass filter for a 2D image for two different cut off frequencies.
9. Read an input image and perform high pass filtering in the frequency domain using matlab.
10. Read an image , the blur the image. Then degrade the image by means of known blur. Apply the inverse filter to the blurred image and see the restored image.
11. Extract red, green, blue components for the input color image and display the results in MATLAB. Identify the max grey values for each color component.
12. Generate a tag using arithmetic coding procedure to transmit the word "INDIA".

**Analyse**
- Differentiate between sampling and quantization.
- Differentiate between image translation and scaling.
- Differentiate between lossless and lossy compression and explain transform coding system with a neat diagram.
- Why the restoration is called as unconstrained restoration? Justify your answer.
- How a degradation process is modeled?
- How cones and rods are distributed in retina?
- How sub image size selection affects transform coding error?
- Show that the Sobel and Prewitt masks in image give isotropic results only for horizontal and vertical edges and for edges oriented at +/- 45°, respectively.

**Evaluate**
- How the derivatives are obtained in edge detection during formulation?
- How is line detected? Explain through the operators.

**Create**
- Derive the CMY intensity transformation function \( S_i = K_i + (1-K_i), i=1,2,3 \) for (C,M,Y) from its RGB counter part \( S_i = K_i, i=1,2,3 \) for (R,G,B).
- Show that 2D gaussian is separable while laplacian of a Gaussian operator (LOG) is not separable.
5IT011 UNIX INTERNALS 3003

Course Objectives
understand about the Operating System of Unix
learn the concept of System calls, file system, Process management
study the different Memory Management techniques and Input output operation of Unix
Operating system

Course Outcomes (COs)
Understand the structure of Unix operating System and execute its basic commands
Describe system calls, buffer management and kernel functionalities in UNIX OS
Implement the concepts of files system and authentication process.
Apply memory management policies and I/O subsystems in developing Unix environment.

UNIT I 8 Hours
OVERVIEW
General Overview of the System: History - System structure - User perspective - Assumptions about
hardware. Introduction to the Kernel: Architecture of the UNIX operating system - Introduction to
system concepts. The Buffer Cache: Buffer headers -Structure of the buffer pool - Scenarios for
retrieval of a buffer - Reading and writing disk blocks

UNIT II 8 Hours
FILE SUBSYSTEM
Internal representation of files: Inodes - Structure of a regular file - Directories - Conversion of a
path name to an Inode - Super block - Inode assignment to a new file

UNIT III 10 Hours
SYSTEM CALLS FOR THE FILE SYSTEM
Open - Read - Write - File and record locking - Adjusting the position of file I/O - Lseek - Close -
File creation - Changing directory, root, owner, mode - stat and fstat - Pipes - Dup - Mounting and
unmounting file systems - link - unlink

UNIT IV 10 Hours
PROCESSES
Process states and transitions - Layout of system memory - The context of a process .Process
Control : Process creation - Signals - Process termination - user id of a process -The Shell - System
boot and the INIT process - Process Scheduling-algorithm - scheduling parameters

UNIT V 9 Hours
MEMORY MANAGEMENT AND I/O
Memory Management Policies: Swapping-allocation swap space - swapping processes out - fork
swap- expansion swap-swapping processes in. The I/O Subsystem: Driver Interface - Inter process
communication-process tracing

FOR FURTHER READING
Allocation of disk blocks-Advantages and disadvantages of the buffer cache - Creation of special
files- Invoking other programs - Streams-sockets

Total: 45 Hours
Reference(s)

Uresh Vahalia, Unix Internals The New Frontiers, Pearson Education, 2010

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 4 2 6</td>
<td>2 6 2 8</td>
<td>4 4 2 4</td>
<td>4 4 2 4</td>
<td>4 4 2 4</td>
<td>4 4 2 4</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>2 2 4 6</td>
<td>2 2 8 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2 2 4 6</td>
<td>2 2 8 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2 2 4 6</td>
<td>2 2 8 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>2 2 4 6</td>
<td>2 2 8 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>4 2 6 4</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

How will you retrieve the properties of a file?
What are the contents of password file?
Recall binary semaphore?
What is the use of ping command?
List the major system calls used for process control in Unix
Enumerate the various entries in a mount table.
List out the various steps for context switch
Explain the procedure for mounting a file system in UNIX operating system.
Define Clist in terminal drivers.
Write an algorithm for opening a device in driver interface.

Understand

Write the usage of grep command in Unix with syntax.
Give a static view of process state and transitions with explanation.
Represent the usage of a swap device, swapping system and paging system.
The process control subsystem is responsible for process synchronization in Unix. Discuss the reasons along with the data structures related to it.
Compare the system calls : change owner and change mode.
Summarize an algorithm for reading a regular file in UNIX file system.
Elucidate the process state model for the UNIX system and the set of state transitions with the complete process state transition diagram.
Illustrate DUP system call using a sample code.
Compare and contrast the system calls : stat and fstat.
Discuss the page fault related to validity fault and detail all the cases when the page is faulted.

Apply

Draw the file system layout and define the fields.
Assume that block 2 is the beginning of the inode list and that there are 8 inodes per block, then in which disk block does inode number 8 and 9 fall?
Perform a copy operation by creating a new process in Unix and explain.
Implement the operating system primitives that can be used as building blocks to build complex programs in Unix.
11 Describe the system structure of the Unix system with a neat diagrammatic representation. Suppose the kernel does a delayed write of a block. What happens when another process takes that block from its hash queue from the free list? When opening a named pipe for reading, a process sleeps until another process opens the pipe for writing. Why? Explain why the process cannot return successfully from the open state and continue processing until it reads from the pipe, and sleep in the read. Illustrate the procedure for receiving a message in system V IPC. Show how the communication enhanced between the client and server using sockets in UNIX.

**Analyse**

The best hash function is one that distributes the blocks uniformly over the set of hash queues. What would be an optimal hashing function? Should a hash function use the logical device number in its calculations? Show the contention between two process for a free buffer and for between three processes for a locked buffer.

**Evaluate**

How would you implement lock and unlock methods for a process executing in kernel mode? How would you implement a conditional P operation? Devise an algorithm that tracks the allocation of space on a swap device by means of a bit map instead of the maps. Compare the efficiency of two methods. The Multics system contains an algorithm for sleep and wakeup with the following syntax: Sleep(event); Wakeup(event, priority); That is, the wakeup algorithm assigns a priority to the process it is awakening. Compare these calls to the sleep and wakeup calls in the UNIX system. The algorithms for the page stealer and for the validity fault handler assume that the size of a page equals the size of a disk block. How should the algorithms be enhanced to handle the cases where the respective sizes are not equal? What is region? Attribute any 3 region system calls that are invoked by a process, one when getting hold a region, one during execution and one while relinquishing it back. What is region? Attribute any 3 region system calls that are invoked by a process, one when getting hold a region, one during execution and one while relinquishing it back. Critique the algorithm for converting the path name to inode.

**Create**

If several processes contend for a buffer, the kernel guarantees that none of them sleep forever, but it does not guarantee that a process will not be starved out from use of a buffer. Redesign getblk so that a process is guaranteed eventual use of a buffer. Enumerate the functions of a clock interrupt handler. Explain any 3 function along with the system calls and their data structures.

---

**15IT012 MOBILE TECHNOLOGIES**

**Course Objectives**

Introduce wireless communication and networking principles, that support connectivity to cellular networks and wireless devices

Understand the use of transaction principles over wireless devices to support mobile business concepts.

Understand the working of various cellular networks through the transmission protocols.
**Course Outcomes (COs)**

Get clear idea with the working principles of wireless networks, characteristics and limitations of mobile hardware devices including their user-interface modalities.

Develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.

**UNIT I**

**WIRELESS COMMUNICATION FUNDAMENTALS**

9 Hours

Need and Application of wireless communication - Wireless Data Technologies Market for mobile

Wireless transmission - Frequencies for radio transmission - Signals - Antennas - Signal Propagation -

Multiplexing - Modulations - Spread spectrum - MAC - SDMA - FDMA - TDMA - CDMA.

**UNIT II**

**TELECOMMUNICATION NETWORKS**

9 Hours

Telecommunication systems - GSM - DECT systems - Architecture and protocols - Tetra frame

structure - UMTS basic architecture and UTRA modes - Broadcast Systems - DAB - DVB.

**UNIT III**

**WIRELESS LAN**

9 Hours

Introduction Infrared v/s Radio transmission - Infrastructure and ad-hoc network - IEEE 802.11 -

Architecture - services - MAC - Physical layer - IEEE 802.11a - 802.11b standards HIPERLAN -

Blue Tooth.

**UNIT IV**

**MOBILE NETWORK LAYER**

9 Hours

Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations) - Dynamic Host


**UNIT V**

**TRANSPORT AND APPLICATION LAYERS**

9 Hours

Traditional TCP - Indirect TCP - Snooping TCP - Mobile TCP - Fast retransmit/fast Recovery -

Transmission/time - out freezing - Selective retransmission - Transaction oriented-Classical TCP

improvements.

**FOR FURTHER READING**

Mobile WiMax - Multihop relay networks - Femtocells and fixed-mobile convergence

**Total: 45 Hours**

**Reference(s)**


Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

- Enumerate the applications of wireless networks.
- Define ASK and FSK with diagram.
- Does GPRS need new information? Why?
- Whether DVB can be used for High speed internet – justify?
- What are the benefits of reservation schemes in TDMA?
- What is the basic task of MAC layer in IEEE 802.11?
- Write any two factors that affect the performance of Ad-hoc networking?
- Enumerate the roles played by Foreign Agent (FA) in assistance to Mobile node (MN).
- Discuss some of the routing metrics to be considered in a mobile network layer.
- Define the role of transaction layer in WAP.

Understand

- Does GPRS need new information? Why?
- Looking HLR/VLR database approach used in GSM – how does it limits the scalability in terms of uses?
- Compare and contrast IEEE 802.11 WLAN, HiperLAN and Bluetooth with a typical example.
- How handover is carried out in WATM and list the requirements of location management in WATM.
- Discuss some of the routing metrics to be considered in a mobile network layer.
- Why agent solicitation is necessary?
- Enumerate the roles played by Foreign Agent (FA) in assistance to Mobile node (MN).
- Identify the purpose of DHCP in achieving mobility in network layer?
- Discuss some of the routing metrics to be considered in a mobile network layer.
- Draw the packet format of Registration request in Mobile IP.

Apply

1. How polling scheme establish master slave relationship to allocate time slots in TDMA?
2. How does inhibit sense multiple access (ISMA) detects a shared medium is busy or not?
3. Whether DVB can be used for High speed internet – justify?
4. How data burst format is defined in GSM system?
5. How does a Bluetooth device discover a Bluetooth network?
6. Give a neat sketch of Format of an IEEE 802.11 PHY frame using FHSS.
7. What could be the quick solutions to achieving mobility in network layer and why they don’t work?
8. Why does I-TCP isolate problems on the wireless link?
9. Why has a scripting language been added to WML? How can this language help saving bandwidth and reducing delay?
10. Describe the several standard libraries for WMLScript specified by WAP.

Analyze

Looking HLR/VLR database approach used in GSM – how does it limits the scalability in terms of uses?
- How does inhibit sense multiple access (ISMA) detects a shared medium is busy or not?
Why CSMA/CA fails in wireless networks?

Perform coding and spreading of the following data 101 with sender A and data 100 with Sender B whose key values are Ak=010011 and Bk=110101 respectively. Draw and explain the coding and spreading of both A and B along with their reconstruction using CDMA.

Analyze the GSM, DECT, TETRA and UMTS systems with reference to the functions of OSI layers.

Is directional antenna useful for mobile phones? How can the gain of an antenna be improved?

What features of a GSM system is provided by the SIM card in a mobile station?

With a focus on security, what are the problems of WLANs? What level of security can WLANs provide, what is needed additionally and how far do the standards go?

Explain how tunneling works in general and especially for mobile IP using IP-in-IP, minimal, and generic routing encapsulation, respectively. Discuss the advantages and disadvantages of these three methods.

Evaluate

Evaluate the security features of WAP and find out the problems that will occur in WAP security layer.

Can the problems using TCP be solved by replacing TCP with UDP? Where could this be useful and why is it quite often dangerous for network stability?

Create

Develop a simple mobile content application for telecommunication systems.

Design an architecture for a mobile computing based business application.

15IT013 OPEN SOURCE SYSTEMS

Course Objectives

Impart knowledge on Open source system and its benefits in application development

Learn different open source system such as Language, Database and operation system

Develop web based applications using open source systems

Course Outcomes (COs)

Understand Open Source Software tools and techniques to develop applications

Analyze the advantages and disadvantages of Open Source tools and languages with respect to proprietary softwares

Apply the Open Source Softwares in developing web based Applications and Internet of Things.

UNIT I 8 Hours

INTRODUCTION TO OPEN SOURCE OPERATING SYSTEMS


UNIT II 8 Hours

OPEN SOURCES DATABASE

MySQL: Introduction - Setting up account - Starting, Terminating and Writing your Own SQL programs - Record Selection Technology - Working with Strings - Date and Time - sorting Query Results - Generating Summary - Working with metadata - Using Sequences - MySQL and Web.
UNIT III

OPEN SOURCES PROGRAMMING LANGUAGES
11 Hours

PHP - Introduction - Programming in Web Environment - Variables - Constants - Data Types - Operators - Statements - Functions - Arrays - OOP - String Manipulation and Regular Expression - File Handling and Data Storage - PHP and SQL Database - PHP and LDAP - PHP connectivity - Sending and Receiving E-mails - Debugging and Error Handling - Security - Templates

UNIT IV

PYTHON
9 Hours

Syntax and Style - Python Object - Numbers - Sequences - Strings - Lists and Tuples - Dictionaries - Conditional and Loops - Files - Input and Output - Errors and Exceptions - Functions - Modules - Classes and OPP - Execution Environment.

UNIT V

SERVER TECHNOLOGIES
9 Hours


FOR FURTHER READING

MongoDB - Android - Ruby on rails - Webkit - openBSD - Unidata - Firebird

Total: 45 Hours

Reference(s)

Rasmus Lerdorf and Levin Tatroe, Programming PHP, oreilly, USA, 2013.
Peter Wainwright, Professional Apache. Wrox Press, New Delhi, 2010
H.S. Lahman Model-Based Development: Applications 1st edition Pearson Education Inc, 2011

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4  4  2  6</td>
<td>2  6</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>2  2  6</td>
<td>2  8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2  2  4</td>
<td>2  6</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2  2  6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>2  4  2</td>
<td>4  4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
List some of the GNU tools
What are the various PHP's LDAP client functions?
What are the different error handling methods in PHP?
What is the system call available to change the personality?
Give the system call for cloning.
Explain the tools that are available for managing MySQL Server.
List the two types of methods for retrieving rows in Python.
Explain the features of Linux with respect to different Linux distributions.
What are the packages required to secure server with SSL?
How do you keep track of different versions of code?

Understand
List the four important factors that led to the development of open source software.
What are the various types of errors in Python?
Define restricted execution and terminating execution.
What are the ways in which signal can be generated?
List five environmental variables. Describe their roles.
What is shell programming? Explain with examples how expressions are evaluated in the shell programming.
Write a note on Process management with Linux along with relevant command used for the process management.
How can we obtain digital certificate from Certifying digital authority?
Explain various pipes and redirects.
What is the role of init signal?

Apply
1. Write a simple Python program using MYSQL database
2. Write GUI programs using FOSS tools in Linux
3. How can you connect to the MySQL Server
4. How can you access elements using slice operator?
5. How to Access Values (Characters and Substrings) in Strings.
6. Explain the role of Linux in Android Architecture.
7. Python is multi threading. Is it a good idea? List some of the ways to get some python code to run in a parallel way.
8. Write a note on "Working with a web using shell script".
9. Explain the role of /etc/shadow and /etc/group files with respect to user administration.
10. How is Logical Volume Manager used in Linux kernel.

Analyse
Distinguish Kernel mode and user mode.
List out the difference between mysql_connect and mysql_pconnect?
Analyze the differences between MySQL_fetch_array(), MySQL_fetch_object(), MySQL_fetch_row()?
Define flat files and mention its advantages over databases
Differentiate function and procedure
How function Declaration and Definition are different from other programming languages
Compare Open source software with other software

Evaluate
Why do so many organizations use MySQL?
What are the capabilities provided by MySQL client APIs?
List out the characteristics of LDAP

Create
Describe the steps for configuring Linux machine as the DNS Server.
Explain partition of hard disk with respect to dual boot environment. Also explain the purpose of boot loader.
Course Objectives
- Understand the purpose and categories of Bioinformatics technologies.
- Understand the neural network concepts in Bioinformatics.
- Study about the Microarray Analysis.

Course Outcomes (COs)
Understand the concepts of genomics, proteomics and Data mining in Bioinformatics
Evaluate bioinformatics algorithms such as dynamic programming, hidden markov models and monte carlo
Design various bioinformatics tools for pattern matching and visualization
Apply Microarray Analysis for Gene classification and genome expression

UNIT I INTRODUCTION
Need for Bioinformatics technologies - Overview of Bioinformatics technologies - Structural bioinformatics - Data format and processing - Secondary resources and applications - Role of Structural bioinformatics.

UNIT II DATA WAREHOUSING AND DATA MINING IN BIOINFORMATICS
Bioinformatics data - Data warehousing architecture - Data quality - Biomedical data analysis - DNA data analysis - Protein data analysis - Neural Network Architecture - Neural Network Applications in Bioinformatics.

UNIT III MODELING FOR BIOINFORMATICS
Hidden markov modeling for biological data analysis - Sequence identification - Sequence classification - Multiple alignment generation - Comparative modeling - Protein modeling - Genomic modeling - Probabilistic modeling - Bayesian networks - Boolean networks - Molecular modeling.

UNIT IV PATTERN MATCHING AND VISUALIZATION

UNIT V MICROARRAY ANALYSIS

FOR FURTHER READING
Biological Data Integration System - Applications in bioinformatics - Computer programs for molecular modeling - DNA, Protein, Amino acid sequences - Tradeoffs - Drug Discovery Process.

Total: 45 Hours
Reference(s)

Yi-Ping Phoebe Chen, BioInformatics Technologies, Springer Verlag, 2010
M. Abhilash, Introduction to Bioinformatics and Microarray Technology, CBS Publishers & Distributors, 2010

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>23</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

What are the three primary roles of Hidden Markov Modelling?
What is called Dirichlet density?
What are the key steps in the PHMM for multiple sequence?
State Comparative modeling.
State some of the Comparative Modeling Servers.
What is meant by Probabilistic Boolean Networks?
State twenty different kinds of amino acids.
What are the important problems in DNA and protein sequence analyses?
Give formula for one-dimensional case in multifractal analysis.
State the characterization of polypeptide structure for Protein structure.
What are the data formats used in Bioinformatics?

Understand

Define one dimensional DNA walk model.
Define HP model.
Define generalized fractal dimensions.
Define scaling exponent for multifractal analysis.
Define Single Gene, Multi-species Approach.
Define Multifractal Analysis.
Why microarray technology is important?
List out the Preprocessing step Image analysis.
How filtering is done Image analysis in microarray?
Mention the characteristics of Biological data in Bioinformatics.

Apply

Apply the Object-oriented method to design data in Biological Database to provide powerful search based on relation.
SRS is information retrieval system using specified keywords. By using SRS functionality, how to extract biological data sequences.
Identify ethical situations that healthcare workers may face and how to apply the principles of moral problem solving to ethical decision making. Describe the roles of the risk management department of the healthcare facility.
Enumerate various machine learning approaches used in computational biology.
Apply the Hidden Markov Modeling for Multiple Alignment Generation.
Using PHMM how to find the most probable path for Multiple Alignment.
Identify the general characteristics of Bayesian Networks works and how its helpful for Modeling in protein analysis.
Using Chaos Game Representation explain the Protein Structures formation.
Implement multifractal spectra for classification Genes in biological process.
Apply Hybrid Petri Net for for biological processes

Analyse
Compare Bayesian Networks and Probabilistic Boolean Networks
Compare Protein and Genomic modeling.
How Protein conformations are done in Game representation?
How Modern Computer Programs are helpful for Molecular Modeling?
Differentiate PCA and ICA.

Evaluate
Explain the Needs of Bioinformatics Technologies.
Describe the process of Functional Assignments in Structural Genomics
Describe in detail about structural classifications with example.
Discuss in detail about Hierarchical Framework for Identification.
Explain the steps that followed for Genomic modeling.

Create
Sketch out Boolean cell regulation representation and explain the Basic unit of Probabilistic Boolean Network.
Derive generalized fractal dimensions for sequence derivation.

15IT015 JAVA FRAMEWORKS

Course Objectives
- Familiarize the fundamental components of struts 2 framework
- Understand design and architecture of Grid computing environments
- Develop grid computing applications using Globus or similar toolkits

Course Outcomes (COs)
- Design and deploy web applications using struts 2 framework
- Develop web applications using spring MVC.
- Map java classes to database tables using hibernate

UNIT I
9 Hours
STRUTS 2
Strut 2 frameworks and its architecture- Web applications-Frameworks for web applications-
Introduction to strut 2 frameworks-Architecture of struts application- annotations-struts2 actions-
Packaging actions-Implementing actions-Transferring data into objects.

UNIT II
9 Hours
INTERCEPTORS AND VALIDATION
MVC-Interceptors-Built in interceptors-Declaring interceptors-creating interceptors-Introduction to
OGNL-Struts tags-data tags-control tags-using JSTL-Result types- Result Global results-
Introduction to validation framework- Introduction to i18n.
UNIT III
SPRING
9 Hours
Spring modules-Inversion of control(IOC)-Injecting dependencies-IOC in enterprise applications-Introduction to Aspect oriented programming-Bean factory-Application context-Life cycle of beans-Wiring with XML-Injecting dependencies via setters, constructors-Introduction to Auto wiring-AOP-Creating advice-Defining point cuts-Managing Transactions-Understanding transactions-Programming transactions-Declaring transactions-Securing spring applications-Acegi security-Managing authentication-controlling access-securing web applications - Spring Webflow

UNIT IV
HIBERNATE
9 Hours
Object Persistence-using direct jdbc-Persistence with hibernate-configuring hibernate-creating mapping definitions-building session factory-Persisting-retrieving objects-session cache-connection pools-Transactions.

UNIT V
HIBERNATE QUERY LANGUAGE
9 Hours
Association-Types-components-Persisting collections and array-HQL-Querying objects with HQL-Criteria queries-stored Procedures- Integrating struts, spring and hibernate.

FOR FURTHER READING
Play : layout customization , validation ? Spark : using WebSockets and Spark to create a real-time chat app

Total: 45 Hours

Reference(s)
Donald Brown, Chad Michael Davis and Scott Stanlick, Struts 2 in action, second edition, Manning Publications 2008
Patrick Peak and Nick Heudicker, Hibernate Quickly, Manning Series, 2005
Nicolas Leroux and Sietse de Kaper, Play for Java, Manning, 2014

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>F C P M</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>2</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>F C P M</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>F C P M</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
Define Model-View- Controll Architecture.
List the supports provided by Struts2.
State the purpose of dispatcher Resultype.
List the four types of Struts Tags.
List the modules in core containers.
Define Spring Framework.
State the advantages of ORM over JDBC.
Define the detached objects in hibernate.
Define criteria in hibernate.
List the methods used to create HQL and SQL Queries.

**Understand**
- Identify the requirement for actions in Struts2.
- Summarize the difference between Struts 1 and Struts 2.
- Identify the suitable interceptor for file upload support.
- Explain the need for Validation mechanisms to validate the user input.
- Compare Bean Factory and Application Context
- Illustrate with an example how dependency injection minimizes the amount of code in the application.
- Infer that the hibernate needs a public mutators (setters/getters).
- Illustrate the concept of Hibernate to take the values from Java class attributes and persist them to a database table.
- Differentiate between HQL and SQL.
- Explain the deployment structure of hibernate with a web application.
- Classify the built-in types defined for mapping java and sql types.

**Apply**
- Implement the simple login page using Struts 2 Architecture and deploy the application in Apache server to test it.
- Design a welcome page using Struts 2 MVC architecture.
- Implement the validate method to check whether the username field is blank or not.
- Use the timer interceptor to measure how long it took to execute an action method defined in the Action class.
- Create a simple application that takes the name of the person and his age from the user form using Spring.
- Use Jdbc Template class to connect a student database with your application to search for a particular student.
- Implement an application class to store the details of the participants registered for the event using hibernate.
- Design a POJO class "Employee" with setters and getters for the following information: a) Emp_name b) Emp_Id c) Emp_Age d) Emp_Salary
- Demonstrate how you would use the Order class to sort the result set obtained from a table.
- Design criteria for the following scenarios. To get records having salary more than 2000. To get records having salary less than 2000. To get records having fnistName starting with "Di"

**Analyse**
- is it necessary to design a web page using framework like struts? Justify the answer.
- In Struts1, the front-controller was a Servlet but in Struts2, it is a filter. Resolve the possible reason to change it to a filter.
- Does the order in which interceptors execute matters? Â If yes then why?
- Differentiate between EL and OGNL.
- A bean can be marked abstract by abstract=true, does not that mean we have to make the corresponding java class abstract?
- What would happen if we have a prototype bean injected into a singleton bean? How many objects of prototype bean object will be created?
- Is it mandatory to have the hibernate objects implement Serializable? Justify your answers.
- If you use more than one database in your application, How many SessionFactory objects are needed? Conclude the answer.
- Why it is considered a best practice to have the setter of the id to be private? Justify the answer.
Evaluate
If you have a column of fixed character length, determine the mapping type to be used in hibernate.

Create
Create a web application for a student portal by integrating struts and hibernate. Design a web application for an online Quiz.

15IT016 ARTIFICIAL INTELLIGENCE 3 0 0 3

Course Objectives
Recognize the characteristics of AI that make it useful to real-world problems
Understand the strengths and limitations of various state-space search algorithms, and choose the appropriate algorithm for a problem

Course Outcomes (COs)
Implement basic AI algorithms
Identify appropriate AI methods to solve a given problem
Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports

UNIT I
INTRODUCTION
Basic definitions, History, Intelligent agents, Agents and environments, Structure of agents - Problem Solving - Problem solving agent

UNIT II
SEARCHING TECHNIQUES
Informed search and exploration - Informed search strategies - heuristic function - Local search algorithms and optimization problems - Local search in continuous spaces - Online search agents and unknown environments - Constraint satisfaction problems (CSP).

UNIT III
KNOWLEDGE BASED AGENTS
Knowledge representation, Logic, Proposition, Inference, First order logic, Inference in FOL, Algorithms, Knowledge representation issues, Semantic Net, Frames

UNIT IV
LEARNING AGENTS

UNIT V
PLANNING AND PROBABILISTIC AGENTS
Planning problem, Partial order planning, Conditional planning, Multi agent planning, Uncertainty and probabilistic reasoning

FOR FURTHER READING
Medicine, Industrial automation, FMS and Robotics, Management and Business Intelligence

Total: 45 Hours
Reference(s)
Kevin Knight, Elaine Rich and Nair, Artificial Intelligence, Tata McGraw Hill, New Delhi, 2008
Mishra R B, Artificial Intelligence, PHI Learning Pvt. Ltd., New Delhi, 2011
Padhy N P, Artificial Intelligence and Intelligent Systems, Oxford University Press, New Delhi, 2005
Dan W Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning Pvt. Ltd., New Delhi, 2010

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>20</td>
<td>22</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
What are the approaches followed to have AI?
Define AI
What is a rational agent?
What are the elements of an agent?
What are the various local search algorithm?
What are the various local search algorithm?
Explain the various forms of learning
What are the two choices for activation function?
What are the categories of neural network structures?
What is an ensemble learning?
What are the components of a genetic algorithm?
Explain any two heuristic searches in detail

Understand
Define Agent with a diagram
Explain the various methods of logical formulation in logical learning?
Write in detail the EM algorithm.
4. What are the various steps in knowledge engineering process of a first order logic?

Give the Syntax and Semantics of a first order logic in detail with an eg
Explain in detail the concept of theorem provers
7. Explain forward chaining and backward chaining in detail for a first order definite clauses

Explain constraint satisfaction problem with an example
What is greedy best first search?
What is admissible heuristic?
11. What are the various steps in knowledge engineering process of a first order logic?

**Apply**
- State the design issues that affect the learning element.
- State the factors that play a role in the design of a learning systems.
- How learning is done on a complete data using statistical methods?
- What is a model based reasoning systems?
- What are the problems faced by a local search algorithm?
- Explain online search agent working using depth first exploration
- Explain genetic algorithm as a local search
- Write in detail the learning of an agent in online search method
- Explain how solutions are searched by a problem solving agent
- Elaborate upon the process of knowledge engineering with electronic circuits domain.

**Analyse**
- Distinguish omniscience and rationality
- State the difference between utility function and performance measure
- State the difference between agent function and agent program?
- What is the difference between the two quantifiers in the logics
- What distinguish general purpose ontology and special purpose ontology?
- What are the reasons for the introducing of quasi-logical form?
- Differentiate Online search and offline search.
- Analyze the factors that affect the Quality of heuristic.

**Evaluate**
- Write a PEAS description for an automated taxi?
- State the decision tree as a performance element.
- How are explanation based learning done?

**Create**
- Write a PEAS description for an automated taxi?
- Write a PEAS description for an automated taxi?
- Explain parsing for a search problem with chart-parsing algorithm
- 4. Elaborate on the semantic augmentations for an English fragment including tense, quantification and pragmatic interpretation.

**Course Objectives**
- Learn the theories and principles underlying web site design.
- Understand how to develop web sites through an iterative process.
- Provide necessary skills in using the various technologies and tools for developing web sites.

**Course Outcomes (COs)**
- Identify and describe various types of user interfaces
- Perform prototyping and testing of initial versions of user interfaces
- Understand the importance of iterative design and produce usable software
UNIT I
THE USER INTERFACE-AN INTRODUCTION

UNIT II
HUMAN COMPUTER INTERACTION

UNIT III
WINDOWS

UNIT IV
MULTIMEDIA
Providing the Proper Feedback- Guidance and Assistance- International Considerations- Accessibility- Icons- Multimedia.

UNIT V
WINDOWS LAYOUT TEST
Possible Problems with Color-Choosing Colors for Textual Graphic Screens- Organizing and Laying out Screens- The purpose of Usability Testing- Scope- Importance- Prototypes- Developing and Conducting Test- Analyze, Modify and Retest.

FOR FURTHER READING
UI MOCKUP Design- UX designer Networking

Total: 45 Hours

Reference(s)
http://www.uxnet.org/

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>4</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>12</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>
Assessment Questions

Remember
State the Characteristics of Direct Manipulation
List any four Graphical system disadvantages.
Define Visualization.
Compare the Characteristics of graphical and web user interface.
Discuss the advantages and drawbacks of graphical systems in detail.
With a neat sketch discuss the structure and content of menus.
Explain in detail about the characteristics and types of Icons.
What are the different kinds of usability testing? Explain four in detail.
List some software tools used for user interface design.
How to eliminate blue border around the linked image on web page?

Understand
With an example elaborate the techniques used for requirements analysis.
Discuss in detail about any four presentation controls.
Differentiate between cascading and unfolding.
Give any 2 applications which utilize the human interaction speed.
Justify why direct manipulation is not feasible for all screen objects and actions.
Differentiate GUI and Web Page Design.
Explain the importance of human consideration in UI design with suitable example?
What are the different ways to integrate a CSS in to webpage?
How will non supporting browsers support DHTML?
List different types of style sheets and how to link them?

Apply
1. With an example explain how to separate content and design in CSS?
2. With suitable illustration explain the importance of human consideration in user interface design.
3. With suitable examples explain how accessibility in web pages is improved with the help of images and icons.
4. Discuss in detail about the three dominant paradims in the development of user interface with an example.
5. Consider online railway booking system as an example and explain in detail about gizmos and its types.
6. With a neat sketch explain briefly about the Structure of Menus and how they can be phrased.
7. Explain the types of Device Based Controls and also mention the guidelines for selecting the proper device-based controls.
8. Assume that a text has to be fixed over an image. Specify the steps to perform this operation.
9. Develop a conceptual model of the system based upon the library book management model.
10. What are the obstacles encountered in user interface design process? Discuss the impact of human characteristics in design with suitable example.

Analyse
If background and colour should always be set together, then why do they exist as separate properties?
Compare and contrast device based controls and screen based controls.
Is UID Important? Why?
Difference between direct and indirect Manipulation.
Distinguish between undo and redo operations.
Identify the factors involved in choosing platforms for design and development of system.
Justify why direct manipulation is not feasible for all screen objects and actions.
Evaluate
Is human considerations in design is important. Justify.
When do you have to do localization?
With suitable examples explain how the human characteristics improve the web user interface design.

Create
Develop a proper design for given Requirement “Raghu wants to develop a portal for his shop to encourage their customers for online shopping. His customer can vary from young age to old age. He does not want to unsatisfy his customer to move between many pages and to type more. He needs a portal in such a way that it can also be accessed through keyboard also. Design a screen prototype to satisfy Raghu to give you the order”
Design a website for following Requirement “Sharanya wants to develop an education portal as virtual class room for her subject. She wants only her students to access the portal to submit assignment, online test. She will make corrections and post again. Students can access notes and her lecture from the portal. Develop a prototype to implement all the functionalities”

15IT018 3D GAME PROGRAMMING 3 0 0 3

Course Objectives
Learn the Graphical user Interfaces for 3D games with modern technologies.
Understand the multi-file 3D games with collision detection and scoring.
Discover the appropriate methods for handling 3D Game effects with Visibility.

Course Outcomes (COs)
Use the principles and techniques with real-time rendering for 3D game programming.
Implement the multi-file 3D games with collision detection and scoring.
Analyze the techniques used to measure the factors affecting 3D graphics performance

UNIT I
MATHEMATICAL PREREQUISITES

UNIT II
TRANSFORMATIONS

UNIT III
3D INITIALIZATION
UNIT IV
3D FOUNDATIONS

UNIT V
3D VISIBILITY DETERMINATION

FOR FURTHER READING

Total: 45 Hours

Reference(s)
Frank D. Luna, Introduction to 3D Game Programming, Mercury Learning and Information, 2012.
Jacob Seidelin, HTML 5 Games, Wiley Publications, 2014.

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>2</td>
<td>12</td>
<td></td>
<td>8</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
- What is the basic structure for developing a game?
- Define “Pixel Art”.
- How can you reduce game lag?
- List the free multi-platform game library used for development.
- Identify the important factor to consider when working on a game.
- How many polygons does the typical 3D accelerator chip process at a time?
- name the function is used to create a custom 24- or 32-bit color.
- What function is used to draw filled rectangles?
- What is the name of the object used to hold a bitmap in memory?
- 10. Describes a function that draws a simple geometric shape, such as a point, line, rectangle, or circle.
Understand

Mention the term given to a small image that is moved around on the screen?
Identify the function that is used to initialize the keyboard handler
Infer the name of the array containing keyboard scan codes?
Discuss about the functions used to draw sprite with both rotation and scaling.
Give the Functions used to initialize the keyboard handler?
How to handle joystick button data using struct?
How to play a sample audio through the sound mixer?
Which function is used to draw a sprite with translucency?
Explain the functions used to convert a normal sprite into a run-length encoded sprite.
Discuss about the parameter used to pass for the installation of sound to initialize the standard digital sound driver.

Apply

Suppose that the view window has height 4. Find the distance d from the origin the view window must be to create a vertical field of view angle $\theta = 60^\circ$.
Given a geometric description of a 3D scene and a positioned and aimed virtual camera in that scene, find the rendering pipeline refers to the entire sequence of steps necessary to generate a 2D image that can be displayed on a monitor screen based on what the virtual camera.
Use the “Shape” demo to use GeometryGenerator::CreateGeosphere instead of GeometryGenerator::CreateSphere.
Try with 0, 1, 2, and 3 subdivision levels.
Construct the vertex and index list of a pyramid and draw it. Color the base vertices green and the tip vertex red.
Apply cinematic animation and Analyze about the two 3D animation fields within the video game industry.
Why are asset-tracking sheets so important?
The resolution of a monitor has a direct effect on the device aspect ratio. What are vector graphics typically used for?
What is the name of the standard basic light setup used in capturing images, whether in photography or 3D animation?
A 3D VFX artist will break a simulation down into smaller pieces to build up the final effect. Apply the rendering and justify.
Why Laser scanning is used as a fast and efficient way to create usable 3D geometry.

Analyze

Write a program that simulates a slide projector by projecting a texture onto the scene.
Experiment with both perspective and orthographic projections.
Analyze and Modify the “Instancing and Culling” to use bounding spheres instead of bounding boxes.
Distinguish with the “Bézier Patch” by changing the control points to change the Bézier surface.
Difference between Multisurface capture and Accurate Capture.
Why markerless motion capture is failed in Large Capture space?

Evaluate

How to organize mesh data and find the low-level class called MeshGeometry to encapsulates the vertex and index buffers, as well to define the subsets of the mesh.
Identify the function that is used to prepare a variable for use within an interrupt callback routine?
Create Rigid bodies with type of effect A. Soft and flimsy, like collisions and deformations
B. Hard collisions with deformations
Evaluate the performance of a parent-child relationship in 3D animation with a hierarchy setup enabling one object to control another object under it in the hierarchy. Can SSAO be implemented on the compute shader? If yes, sketch out an implementation.

Create
Create a scenario with Direct3D about how to use a Windows application that has a main window onto which we can render our 3D scenes. And for the games create a special message loop that checks for messages. Manually create a .m3d file and fill it with cube data. Put the geometry of each face in its own subset so that there are six subsets. Texture each cube face with a different texture.

15IT019 ANIMATION FOR COMPUTER GRAPHICS

Course Objectives
- learn the overall structure of an interactive graphics program
- Master the use of geometric primitives for representing graphic objects
- Provide the basics of application programming interface (API) implementation on graphics hardware tools

Course Outcomes (COs)
- Understand the animation modelling and Graphics Techniques for creating interactive elements.
- Use the graphical models to make animation with render, Illumination and Realism.
- Implement the basic hardware tools used to receive incidents, Behavioural and Time movements.

UNIT I
9 Hours
ANIMATION MODELLING AND GRAPHICS

UNIT II
9 Hours
RENDERING

UNIT III
9 Hours
ANIMATING
Representing attributes numerically - Animating numbers - parametric blending techniques - space curves - world coordination system - camera coordination system - Animating an objects attributes - illumination environment

UNIT IV
9 Hours
ANIMATION TECHNIQUES
Animation- Free-form Animation - Displacement Animation - Behavioural Animation - Dynamic Simulation

UNIT V

TIMED MOVEMENTS
9 Hours
Basic attributes - Timing Machines - Screen Updates - Interrupt Service Routine - Display management- Input - Movement-Changing the Time base - Exit Handler - Timer ISR - Creating Depth and Motion-Remapng

FOR FURTHER READING
Introduction - Computers - Disk storage Image Capture - post production - Television Industry - Flight simulation Architecture- Advertising - Film Special effects - 3D cartoons - scientific visualization - commercial animation systems

Total: 45 Hours

Reference(s)
John Vince, 3D computer animation, Addison Wesley 2002.

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>2 2 4 2</td>
<td>6 2 2 6</td>
<td>6 2 2 6</td>
<td>6 2 2 6</td>
<td>6 2 2 6</td>
<td>6 2 2 6</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>2 2 2 2</td>
<td>12 2 12 2</td>
<td>6 2 6</td>
<td>6 2 6</td>
<td>6 2 6</td>
<td>6 2 6</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2 2 8 2</td>
<td>2 8 2 8</td>
<td>8 2 8</td>
<td>8 2 8</td>
<td>8 2 8</td>
<td>8 2 8</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>6 6 6 6</td>
<td>6 6 6 6</td>
<td>6 6 6</td>
<td>6 6 6</td>
<td>6 6 6</td>
<td>6 6 6</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
Define quadric surfaces
What do you mean by shading of objects?
List the methods available in temporal aliasing.
Explain the terms: Multimedia, Hypermedia, MIDI, MPEG
What are the essentials and qualities for a good animated character?
Name the properties of piano curves.
Define ‘window’ and view port.
List out the methods used for smoothly joining two line segments.
Name the steps involved in 3D transformation?
Describe about various three dimensional display methods.

Understand
Why is it important to draw in perspective?
Distinguish between uniform scaling and differential scaling.
Identify the difference between Random scan/Raster scan displays.
Discuss the properties of Holographic images?
Differentiate between bitmap and pixmap
Differentiate perspective and parallel projection.
Explain the concept of Fractal Compression.
How Image Annotation is done?
How Image Annotation is done?
List out the drawbacks of shadow mapping.
Classify the advantages of flat shading with phone shading.

Apply
1. Write the syntax of smooth shading for 2/3 image.
2. Write the function of bitmap textures.
3. Show the difference A between uniform scaling and differential scaling.
4. Illustrate about the projection types in three dimensional graphics.
5. State the resolution of Facsimile, Document Images and Photographic Images?
6. Name any two three dimensional graphics package procedures related with suitable visible surface.
7. Find the reflection of a triangle defined by the vertices A(1,1), B(5,1) and C(1,5) about a line $y=2x+10$.
8. Show the purpose of stencil buffer in shadowing?
9. Rotate a triangle ABC with vertices A(2, 3, 1), B(3, 4, 5) and C(5, 6, 7) about a line $Y = 2$
10. Prove that rotation followed by translation is not same as translation followed by rotation in three dimension

Analyze
Examine the following transformation with the matrix representations. Give suitable diagram for illustration. Translation. Scaling. Rotation
Prove that 2D Translations are additive, 2D Rotations are additive, 2D Scalings are multiplication with respect to illumination.
Derive transformation matrix for rotation about a line parallel to one of the principle axis in space.
Derive transformation matrix for 3D scaling followed by rotation about fixed point
Prove that rotation followed by translation is not same as translation followed by rotation in three dimension

Evaluate
Rotate a triangle ABC with vertices A(2, 3, 1), B(3, 4, 5) and C(5, 6, 7) about a line $Y = 2$
Scale the surface A(2, 2, 2), B(4, 4, 4), C(5, 5, 5), D(6, 6, 6) with respect to point (7, 7)
Find the transformation matrix for 2D scaling followed by rotation about fixed point
Construct an appealing character using the following shapes. Each shape must be used at least once.
circle
Triangle
Summarize the general procedures for applying two dimensional basic transformations.

Create
Consider a Non-Interlaced raster system with resolution of 1280 By 1024, a refresh rate of 60 Hz, a horizontal retrace time of 5 Microseconds and a vertical retrace time of 500 μs. What is the fraction of the total refresh time per frame spent in horizontal retrace of the electron beam?
Derive transformation matrix for 3D scaling followed by rotation about fixed point

15IT020 USABILITY ENGINEERING 3 0 0 3

Course Objectives
Learn the basic concepts of Usability Engineering
Emphasizes cost-effective methods to develop software projects
Devising test plans for software applications
Course Outcomes (COs)
1. Understand methods to run a usability test
2. Evaluate usability methods and tools
3. Developing software products with high user satisfaction

UNIT I
INTRODUCTION TO USABILITY
8 Hours

UNIT II
USER-CENTERED DESIGN AND USABILITY AWARE DESIGN
10 Hours

UNIT III
ACCESSIBILITY AND UNDERSTANDING USERS
10 Hours
Accessibility - Principles - Using CSS - Other Considerations - Assistive Technology - Mobile Computing and Accessibility - Organizational Goals - Strategic versus Tactical Planning - User Profiles - Types of User Information

UNIT IV
METRICS AND HEURISTIC EVALUATION
8 Hours

UNIT V
USABILITY TESTING AND TECHNIQUES
9 Hours
Usability Lab - Writing Test Plan - Designing Usability Tasks - Card Sort - Interview - Survey - Prototyping - Field Study - Automated Session - Focus Group - Thinking Aloud - Walk-up Kiosk - Opinion Polls

FOR FURTHER READING
Test Goals - Getting Test Users - Choosing EXPERIMENTers - Ethical Aspects of Test with Human Subjects - Test Tasks - Stages of a Test - Performance Measurement - Reliability - Validity

Total: 45 Hours

Reference(s)
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 4</td>
<td>4 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>2 4</td>
<td>4 3 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>3 3</td>
<td>4 4</td>
<td>2 4</td>
<td></td>
<td></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>3 8</td>
<td>4 4 2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>3 4</td>
<td>8 4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

What is usability engineering?
State Jargon theory.
List the ten Usability Heuristics.
Mention the different types of User Information.
Mention any four Cultural Factors.
List out the UCD standard in usability engineering.
Define Assistive Technology.
Expand
a. ANSI
b. NCITS
Define Automated Session.
List out the steps that benefits Designing Usability Tasks

Understand

List out the human factors in usability engineering.
Mention the purpose of User-Centered Design.
Compare Sensation and Perception.
Identify the Human Factors Psychology in usability engineering.
What is Sensory Adaptation?
Write the different types of Cultural Factors.
Explain in detail about life cycle of UCD.
Why we need UCD?
Specify the uses of UCD standards.
Why we need Automated Session?
Discuss in detail about Tactical Planning.
Goals of usability testing:
Performance
Accuracy
Recall -- How much does the person remember afterwards or after periods of non-use?
All of above

Apply

1. Exemplify the concept of Walk-up Kiosk.
2. Discuss the role of Evaluation Methodology for the modern era development.
3. Usability engineering literature differentiates between two types of skilled users - expert and experienced users. We refer to the second group as experienced users, rather than expert users, to acknowledge the fact that they are occasional skilled users. Which of the attributes in Nielsen’s definition of usability (listed below) is especially used as a criterion for assessing the effectiveness of user interfaces developed to be used by experienced users?
4. What are the advantages of using questionnaires in usability research?
5. List out the advantages of usability engineering.
How do questionnaires fit in with other HCI evaluation methods?
How can I tell if a question belongs to a Likert scale or not?
Is a high statistical reliability is not the ‘gold standard’ to aim for?
Why do some questionnaires have sub-scales?
How do you go about identifying component sub-scales?

Analyse
Exemplify the Guidelines for Framework.
Write in detail about test plan.
Mention the uses of Card Sort.
Identify the four Common Metrics.
Compare Usability Magnitude Estimation and Master Usability Scaling.
Specify the functions used for the Heuristics of Web.
How the process of Assembling Data executes?
Why we need CSS?
Discuss in detail about Strategic Planning.
Differentiate Strategic and Tactical Planning.
Think about why you will be doing a usability test:
Usability testing can be carried out at various stages of the design process. In the early stages, however, techniques such as ........... are often more appropriate.
Write any four Organizational Goals.
Which of these is NOT a role in a usability test?
Formal usability testing involves six stages/activities (listed below). At which stage do you start to think about the users?

Create
Rewrite the process flow of User-Centered Design.
Design a test plan for automated ATM machine.

Course Objectives
Learn the Various e-commerce business models.
Understand how companies use e-commerce to gain competitive advantages
Familiarize with the planning and execution of e-commerce projects

Course Outcomes (COs)
Develop an understanding of the foundations and importance of E-commerce
Analyze the impact of E-commerce on business models and strategies
Discuss legal issues and privacy in E-Commerce
Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational.

UNIT I 9 Hours
ELECTRONIC COMMERCE
Frame work, anatomy of E-Commerce applications - E- Commerce Consumer applications - E-Commerce organization applications.

UNIT II 9 Hours
CONSUMER ORIENTED ELECTRONIC COMMERCE
Mercantile Process models-Electronic payment systems: Digital Token-Based - Smart Cards - Credit Cards - Risks in Electronic Payment systems.
UNIT III
MOBILE ELECTRONIC COMMERCE

UNIT IV
E-COMMERCE APPLICATION DEVELOPMENT

UNIT V
E-COMMERCE SECURITY

FOR FURTHER READING

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
Define electronic commerce
List the various components of electronic commerce applications
What is the role of agents for B2B EC?
What is the importance of JIT delivery in B2B E-commerce?
List the benefits & limitations of E-commerce
What are the characteristics of internet-based EDI?
What is an electronic payment system?
What is the use of hypertext links in Internet access?
What do you understand by WWW?
What are the concerns for growth of e-commerce in India?

Understand
Who are the stakeholders in E-Commerce information system? Explain the benefits and limitations of E-commerce
Explain the role of Software Agents in E-Commerce
Describe the functional requirements for online selling and what specialized services and servers perform these functions
Explain Internet, intranet, extranet and their usage and benefits in today’s organization settings
With the help of any example web site explain the perspectives of the buyers and sellers in a B2B Ecommerce web site
Explain the different steps involved in the development of an e-commerce web site.
What is E-shopping? What are the advantages and disadvantages of e-shopping?
Discuss the various threats involved in client server communications and how are they encountered in EC business
Discuss the different online marketing strategies in EC
Write notes on following:
   Content Marketing
   Digital Certificate

Apply
Once a company has acquired customer, the key to maximizing revenue is keeping them. Explain how e-commerce is helpful in customer retention?
Give examples of how the supplier’s information system can be used at every link in the value chain by the customer?

Does Internet access make employees more or less productive? Give an example
Why do you think the travel industry’s Internet growth potential is so great?
Why do you think web-based firms report more security breaches than other companies?
Exemplify a major paradigm change that is occurring in one industry due to the Internet.

Explain B2B E-Commerce using an example of a book distributor who stocks a large number of books, which he distributes via a large network of book sellers. Assume that the distributor has stocks of books of a large number of publishers and book sellers order books as and when their stock is low. Distributors give 1 month's time to booksellers for payment
If internet is to be used for EDI which mail standard is used?
If email is to be used to exchange EDI between two businesses what are the points on which they should agree?
What special precautions should be taken by a bank to ensure that a customer does not double spend the same electronic coins issued to him/her?

Analyse
Compare and contrast the traditional business with electronic commerce
What is e-payment? Why is orientation and standardization required for e-payment businesses?
Analyze the ethical, social and political issues in E-Commerce.
How Internet based advertising is capable of competing with commercial advertising?
Distinguish between passive and active advertising methods
Compare Hypertext versus hypermedia
What is the difference between intranet and extranet?
Compare and contrast the traditional business with electronic commerce in a book shop business
Compare different advertising strategies online
Why is orientation and standardization required for e-payment businesses?

Create
Discuss the case study in online service industry perspective
Discuss about social media impact on e commerce

15IT022 ENTERPRISE RESOURCE PLANNING  3003

Course Objectives
Impart knowledge on Enterprise Resource Planning fundamentals
Learn function and Technical Specification in business application development
Implementation of business application in cloud platform

Course Outcomes (COs)
Understand the concept of Enterprise Resource Planning and Functional Modules in developing ERP Package for various Industries
Analyze the Implementation Process of ERP in different verticals of business Process and its Risk Factors
Apply ERP concepts on e-commerce, process management and Implementation ERP package for large scale Industries

UNIT I
INTRODUCTION  9 Hours

UNIT II
ERP MARKET PLACE AND FUNCTIONAL MODULES  9 Hours

UNIT III
ERP IMPLEMENTATION  9 Hours

UNIT IV
ADVANCED ERP SYSTEMS- BUSINESS PROCESS REENGINEERING  9 Hours
UNIT V

E COMMERCE AND ARCHITECTURE

9 Hours


UNIT VI

FOR FURTHER READING

ERP Systems - ERP on Cloud Computing Model-e-Commerce -Development- Implementation- Business process Reengineering

Total: 45 Hours

Reference(s)


Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 4 2 6</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>2 2 6</td>
<td>2</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>4 2 2</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2 2 2</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>2 4 2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

What are the Reasons for the Growth of ERP market?
Define ERP
Define Vendor
Define Gap analysis
What are the subsystems in an Manufacturing Module?
What are the Business modules present in an ERP package
What are the subsystems in an Sales and distribution Module.
What are the Phases in BPR.
Explain The subsystems of Plant Maintanence Module.
What are the Procedures to be followed in TURBO charge the ERP system

Understand

What are the Internet Technologies in ERP.
What are the main misconceptions about ERP?
What are the limitations of ERP?
What are the main characteristics of MIS?
Discuss the problem areas in ERP implementation.
Explain the solutions offered by QAD.
What is process definition and why is it important?
Who are Vendors & Consultants? Explain the roles and responsibilities of Vendors & consultants.
Briefly describe the various phases of ERP implementation lifecycle?
What are the different types of metrics in performance?

Apply
Discuss the Industrial impact of ERP in post implementation.
How is Supply Chain Management (SCM) integrated with Customer Relationship Management (CRM )
Explain the different phase of BPR details.
What are Ten Mistakes to be avoided in Data Warehousing project
write short notes on 1)Vendors
  2)Consultants
  3)End Users
Explain in detail about the Issues to be consider in planning design and implementation of cross functional integrated ERP systems
  What are the Different Business Units in the Peoplesoft.
  What are the Different Product modules available in JD-EDWARD?
  What are the mySAP Business Suite currently comprises?
  What are the Basic Functions in an Sales order Processing.

Analyse
Differentiate ERP and E-Commerce.
What are the Merits and Demerits in Baan?
Write in details about Organizational impact of Implementation.
Discuss the roles and importance of CRM in today’s business environment
Briefly explain the E-Commerce and E-Business.
Why ERP implementation in challenging?
Why is the pre-evaluation screening required?
What are the Different Business Units in the Peoplesoft?
What are the six Categories in an ORACLE application?
What are the Different Product modules available in JD-EDWARD?

Create
Design ERP package for a school system by considering from enrollment to the completion of school.
Create an ERP module for call taxi maintainance and their travel desk.

15IT023 COMPREHENSION 3 0 0 3

Course Objectives
Understand the basic concepts related to mathematical and computational theory.
Relate the mathematical concepts with Computational concepts.
Demonstrate the Computational concepts with case studies.

Course Outcomes (COs)
Recall the basic concepts related to mathematical and computational theory.
Appear for Graduate Aptitude Test in Engineering (GATE), National Eligibility Test (NET), State Eligibility Test (SET), Indian Engineering Services (IES), Indian Technical Services (ITS), Railway Recruitment Board (RRB).
UNIT I  
ENGINEERING MATHEMATICS  
Section 1: Engineering Mathematics  


Combinatorics: counting, recurrence relations, generating functions.  

Linear Algebra: Matrices, determinants, system of linear equations, eigenvalues and eigenvectors, LU decomposition.  

Calculus: Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration.  


UNIT II  
DIGITAL LOGIC AND COMPUTER ORGANIZATION  
Section 2: Digital Logic  

Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).  

Section 3: Computer Organization and Architecture  
Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).  

UNIT III  
DATA STRUCTURES AND ALGORITHM  
Section 4: Programming and Data Structures  

Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.  

Section 5: Algorithms  
Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide and conquer. Graph search, minimum spanning trees, and shortest paths.  

UNIT IV  
COMPILER DESIGN  
Section 6: Theory of Computation  

Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and context-free languages, pumping lemma. Turing machines and undecidability.  

Section 7: Compiler Design  
UNIT V
OPERATING SYSTEMS
5 Hours
Section 8: Operating System Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

UNIT VI
FOR FURTHER READING
5 Hours
Section 9: Databases
ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

UNIT VII
COMPUTER NETWORKS
6 Hours
Section 10: Computer Networks

Total: 45 Hours

15IT024 INFORMATION STORAGE MANAGEMENT
3 0 0 3

Course Objectives
Understand the functionalities of logical and physical components of a storage
Describe storage networking technologies and Identify different storage virtualization technologies
Explain common storage management activities and solutions

Course Outcomes (COs)
Effectively apply the fundamentals of information storage management
Identify optimized storage technologies that provide cost-effective IT solutions for medium to large scale
Manage virtual servers and storage between remote locations

UNIT I
STORAGE SYSTEMS
8 Hours
Introduction to information storage, Virtualization and cloud computing, Key data center elements, Compute, application, and storage virtualization, Disk dive & flash drive components and performance, RAID, Intelligent storage system and storage provisioning (including virtual provisioning)

UNIT II
STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION
10 Hours
Fibre Channel SAN components, FC protocol and operations, Block level storage virtualization, iSCSI and FCIP as an IP-SAN solutions, Converged networking option-FcoE, Network Attached Storage
(NAS)-components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.

UNIT III
BACKUP, ARCHIVE AND REPLICATION
Business continuity terminologies, planning and solutions, Clustering and multipathing to avoid single points of failure, Backup and recovery methods, targets and topologies, data deduplication and backup in virtualized environment, fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.

UNIT IV
CLOUD COMPUTING CHARACTERISTICS AND BENEFITS
Services and deployment models, Cloud infrastructure components, Cloud migration considerations.

UNIT V
SECURING AND MANAGING STORAGE INFRASTRUCTURE
Security threats, and countermeasures in various domains, Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments-Monitoring and managing various information infrastructure components in classic and virtual environments.

FOR FURTHER READING
Information lifecycle Management (ILM) and storage tiering

Total: 45 Hours

Reference(s)
Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein, "Storage Networks"

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3 1 2</td>
<td>5 2</td>
<td>3 4</td>
<td>2</td>
<td>2 3</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>4 2 2</td>
<td>2 1 3</td>
<td>4 3</td>
<td>2</td>
<td>2 2</td>
<td>3 2</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>4 2 3</td>
<td>3 3 1 2</td>
<td>2 2</td>
<td>3 2 1</td>
<td>1 2</td>
<td>3 1</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>3 2 2</td>
<td>2 2 3 1 2</td>
<td>2 2</td>
<td>2 2 1</td>
<td>2 2</td>
<td>3 2</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>2 2 2</td>
<td>2 2 2 3</td>
<td>2 2</td>
<td>2 2 2</td>
<td>2 2</td>
<td>3 2</td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
What do you mean by digital data?
Which parameter accelerated data growth by storing all types of data, coupled with individual and business needs?
What process facilitates access to a specific document from different locations?
Which part of the disk is used to mount the R/W head?
Indicate the range of average seek time on a typical modern disk?
Identify the reasons for the head crash.
What do you mean by External data transfer rate?
Define data transfer rate.
Define the need of command queuing.
What property describes a landing zone in a disk drive?
Which process minimizes the exposure to a loss of uncommitted cached data when there is a power failure? Explain in detail.
Represent the base layer of the cloud services stack.
What do you mean by Big Data?

**Understand**

Identify the category of the following data "Various aspects of inventory, description, pricing, availability and sales data".
What do you mean by cache dirty bit flag?
State the process of partitioning a physical disk.
A disk drive has a rotational speed of 100 revolutions per second. Calculate is the average rotational latency?
Define Internal data transfer rate
What is characteristic nature of parity-based RAID?
The midrange storage systems have been implemented with_________
Identify the process which allows grouping of two or more physical NICs and treating them as a single logical device?
What is the difference between a restore operation and a resynchronization operation with local replicas?
Explain in detail about Fiber Channel Protocol Stack?
Mention the key considerations for cloud adoption.
Identify the list of reasons which push for opting cloud computing storage.

**Apply**

Which device is used to connected directly to the host and the storage device?
Which process enables creating and presenting a LUN with more capacity than physically allocated to it on storage array?
What is RAID? Explain the three types of RAID techniques and explain how they are classified as RAID 0,1,3,4,5,6 with a neat sketch.
In the context of vulnerabilities in a storage network, what does the attack surface describe?
Explain how information storage security framework is playing a vital role in the storage industry.
Compare authorization and authentication process.
Explain the challenges faced in maintaining the Information & it's scope?
Explain the key parameters in managing storage infrastructure to ensure continuity of business?

**Analyse**

Which cache management algorithm is based on the assumption that data will not be requested by the host when it has not been accessed for a while? Explain in detail
List the problems prevented using RAID technology.
Time to resume application operations must equal to 2 Hours. Justify this statement if the recovery-point objective (RPO) of an application is 2 Hours?
How do Business Continuity and Disaster Recovery Differ?
How does clustering help to minimize RTO?
There are limited backup devices in a file sharing NAS environment. Suggest a suitable backup implementation that will minimize the network traffic, avoid any congestion, and at the same time not impact the production operations. Justify your answer.

An administrator configures six pointer based virtual replica of a LUN and creates eight full volume replica of the same LUN. The administrator then creates four pointer based virtual replica for each full volume replica that was created. How many usable replicas are now available?

What are the cloud challenges for consumers?

List the types of software used in cloud management and service creation tools layer.

What are the two mechanisms can be used to obtain unauthorized administrator access?

Evaluate

Represent expression represents availability of a system in terms of MTBF and MTTR?

What is the minimum number of storage volumes required in the cascade/multihop (synchronous +disk buffered) three-site replication?

A network router has a failure rate of 0.02 percent per 1,000 Hours. What is the MTBF of that component?

Create

A department requires access to the database application from Monday to Friday, 9 AM to 5 PM. Last Thursday at 1 PM the application crashed and it took six Hours to fix the problem. Calculate the availability of the application during last week?

The IT department of a bank provide customers access to the currency conversion rate table between 9:00 a.m. and 4:00 p.m. from Monday through Friday. It updates the table every day at 8:00 a.m. with a feed from the mainframe system. The update process takes 35 minutes to complete. On Thursday, due to a database corruption, the rate table could not be updated. At 9:05 a.m., it was identified that the table had errors. A rerun of the update was done, and the table was re-created at 9:45 a.m. Verification was run for 15 minutes, and the rate table became available to the bank branches. What was the availability of the rate table for the week in which this incident took place, assuming there were no other issues?

15IT025 CLOUD INFRASTRUCTURE SERVICES

Course Objectives

Understand the cloud infrastructure components and Business continuity in cloud computing.

Learn the concept of virtualized Data Center.

Understand the Cloud service models and deployment models.

Course Outcomes (COs)

1. Transform the Classic Data Center to Virtualized Data Center.
2. Create Virtual Machine images and to deploy them on a Cloud.
3. Manage the Cloud infrastructure and its services.
4. Choose suitable Cloud model based on customer requirement.

UNIT I

5 Hours

JOURNEY TO THE CLOUD

Business drivers for cloud computing, Definition of cloud computing, Characteristics of cloud computing as per NIST, Building Cloud Infrastructure, steps involved in transitioning from classic data center to cloud computing environment.
UNIT II
CLASSIC DATA CENTER (CDC)
Application, DBMS, Compute, Storage and Networking, Object based and Unified storage technologies, Business continuity overview and backup. Replication technologies, CDC Management.

UNIT III
VIRTUALIZED DATA CENTER (VDC)
Compute, Storage, Network virtualization techniques, Virtual machine components and process of converting physical to VMs, Block and file level storage virtualization, Virtual provisioning and automated storage tiering, VLAN and VSAN, Key network traffic management techniques in VDC, desktop virtualization, Backup and recovery of Virtual Machines (VMs), VM replication and migration technologies Recovery options from total site failure due to disaster.

UNIT IV
CLOUD COMPUTING AND INFRASTRUCTURE
Cloud services models, Cloud deployment methods, Economics of Cloud, Cloud infrastructure components, Cloud service creation process, Cloud service management process.

UNIT V
CLOUD SECURITY AND MIGRATION TO CLOUD
Security concerns and counter measures in a VDC and Cloud environment, Governance, Risk, and Compliance aspects in Cloud, Cloud security best practices, Cloud models suitable for different categories of users, Consideration for choosing applications suitable for Cloud, Different phases to adopt the Cloud.

FOR FURTHER READING
Service Portfolio Management Processes, Yahoo Pipes, Google App Engine, Google Infrastructure, Amazon Web Services, Windows Azure Application

Total: 45 Hours

Reference(s)
Cloud Infrastructure and Services, Student Guide - EMC Corporation Bangalore 2012,

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Assessment Questions
Remember
When setting up a cloud environment, a company decides to utilize storage virtualization that allows them to abstract multiple disk arrays and present them as a single storage resource. What is the name for this storage virtualization technique?
Which network and SAN configuration/administration approaches will change when setting up a cloud infrastructure?
Name 4 platforms which are used for large scale cloud computing.
Can cloud computing work for any software?
Define the terms: Recovery Point Objectives and Recovery Time Objectives.
List the 2 types of Replication.
List out the characteristic of a guest operating system whose network is configured as a Virtual NAT device.
Define VMM in cloud computing.
Which two security functions should be delivered by firewalls in a cloud network infrastructure

Understand
A software concern would like to leverage cloud computing to provide advanced collaboration services (i.e. video, chat, and web conferences) for its employees but does not have the IT resources to deploy such an infrastructure. Which cloud computing model would best fit the company needs?
A company needs to provide IT services to a worldwide customer base utilizing a diverse set of devices. Draw the architecture of the system and which attribute of cloud computing can help the company deliver such services?
Four different companies provide Storage as a Service capabilities:
Company A stores user data in its primary data center in New York and replicates the data to a backup data center also in New York.
Company B stores user data in its primary data center in Chicago and replicates it to a data center in Atlanta.
Company C stores user data in its primary data center in Los Angeles and stores replicas in the same data center.
Company D stores user data in its primary data center in St Louis and does not replicate the data.
Which company is likely to provide the highest availability? Reveal your answers.
Describe in detail about database solutions and Block storage in cloud computing.
The enterprise is using a hybrid cloud to deliver data services to the end user. The enterprise is also using the cloud to deliver data and services to the end user. When the end user interacts with the enterprise application, the enterprise accesses the cloud to retrieve and/or manipulate the data. The enterprise application returns the results to the end user. What is required for enterprise IT services to simplify the process of switching cloud providers?
Compare and contrast object based storage technology and Unified storage technology.
Sketch and explain the types of replication configurations classified according to the cloud environment.
Illustrate the concept of Google app engine with application.
Which cloud computing feature allows for server consolidation resulting in increased asset utilization and decreased data center energy needs? Explain with example.
Illustrate the applications of classic data center with neat sketch.

Apply
A company must perform a complex analysis for a client, and their computer systems do not have the computation capacity to perform this analysis. How can this analysis be completed quickly and cost effectively?
A company that provides gift giving advice has leveraged collaborative services in a cloud computing environment to provide on line chat between its employees and customers. As the
holiday season approaches, the company is able to easily increase the resources needed in the cloud environment. When the season has ended, the company is able to reduce the resource usage. This allows the company to effectively manage the required computational resources and thereby reduce costs. What type of cloud computing billing model is best fit to this company?

A company operates data centers in two different regions. Energy costs for one of the data centers increases during the warmer, summer months. The company already uses server virtualization techniques in order to consolidate the total number of required resources. How might the company further reduce operating costs at this data center?

A company that provides gift giving advice has leveraged collaborative services in a cloud computing environment to provide online chat between its employees and customers. As the holiday season approaches, the company is able to easily increase the resources needed in the cloud environment. When the season has ended, the company is able to reduce the resource usage. This allows the company to effectively manage the required computational resources and thereby reduce costs. What type of cloud computing billing model is best fit to this company?

Data center clouds are formed by connecting two or more data center cloud networks over wide area network. When building such data center clouds, how the telemetry component is mainly responsible for increasing the network latency?

A company currently experiences 7 to 10 percent utilization of its development and test computing resources. The company would like to consolidate to reduce the number of total resources in their data center and decrease energy costs. Explain how the desktop virtualization feature of cloud computing allows resource consolidation.

A company gathers, stores, manages, and protects data as part of its business. How can it create business value from the data using VDC?

An enterprise needs highly controlled storage and access to their databases as well as managing the infrastructure for web front ends and other applications. They have a large existing IT infrastructure and they are continually expanding the capabilities. How the IaaS model will satisfy all their current needs and enable them to reduce cost?

A company is setting up a cloud environment to host several of their applications. These applications vary in importance and the company wants to ensure that the most business critical applications get the most resource. Which solution will help achieve this goal?

A construction company has outsourced its IT operations (storage, hardware, servers, networking components, etc.) to a service provider. The service provider owns this equipment and is responsible for running and maintaining it. The construction company pays the service provider on a per-use basis. What type of cloud service is the construction company using?

Analyse

Distinguish between financial management and compliance management.
What is the difference between cloud computing and computing for mobiles?
Is cloud computing mostly for larger or smaller organizations?
A company must perform a complex analysis for a client, and their computer systems do not have the computation capacity to perform this analysis. How can this analysis be completed quickly and cost effectively?
Differentiate between local and remote replication in cloud.
The enterprise is using a hybrid cloud to deliver data services to the end user. The enterprise is also using the cloud to deliver data and services to the end user. When the end user interacts with the enterprise application, the enterprise accesses the cloud to retrieve and/or manipulate the data. The enterprise application returns the results to the end user. What is required to implement the cloud service delivery model?
Distinguish between private cloud and community cloud.
Does network topology play an important role in deciding the success of a Cloud Infrastructure?
Now that you have migrated existing applications, what else can you do in order to leverage the elasticity and scalability benefits that the cloud promises? What do you need to do differently in order to implement elasticity in your applications?

**Evaluate**
A company wants to build a test environment to test software updates and new solutions. The environment should mirror the production environment and be secure and inaccessible from outside the company network. The company does not want to invest in infrastructure that may be idle for a significant amount of time. Check whether the PaaS model will satisfy all these requirements?
Can the accelerated migration program be applied to other areas such as Converged Infrastructure? Explain briefly with an example.

**Create**
A company currently experiences 7 to 10 percent utilization of its development and test computing resources. The company would like to consolidate to reduce the number of total resources in their data center and decrease energy costs. How will you offer resource consolidation using the desktop virtualization feature of cloud computing?
An enterprise wants to take advantage of cloud computing but retain control over the construction and delivery of all cloud-based services. Design a cloud deployment model to meet their needs.

---

**Course Objectives**
Understand the components of Advanced Business Application Programming in business process.
Develop business applications based on requirements
To effectively use software for business development

**Course Outcomes (COs)**
Understand the components of Advanced Business Application Programming in business process.
Develop the Business Applications for medium and large scale industries and generate reports.
Use different types of screens for business transactions using screen programming.

---

**UNIT I**
**INTRODUCTION**

**UNIT II**
**ABAP/4 WORKBENCH**
ABAP Statements - Key words - Data Types - Data Objects - Elementary Data Types - User defined Data types - Write Statement - Control Statements - System Variables - Simple ABAP Programs - Modularization Techniques - Complex data objects.
UNIT III
ABAP/4 DICTIONARY
Introduction to ABAP Dictionary - Dictionary Objects: domain ? data element - Structure - Table Type - type group - Data base table - Input Check - Performance Analysis - object dependencies - Views - Search helps - Lock objects - Primary Key and Foreign Key - Table Maintenance Generator.

UNIT IV
REPORTING

UNIT V
DIALOG PROGRAMMING
Screen Programming - Program Interface - Screen Elements - Error Handling - Subscreens - Menus - TABstrip Control.

FOR FURTHER READING
Exploring Search Helps: Elementary search help - collective search help - append search help. Total: 45 Hours

Reference(s)
ABAP workbench Part-I and Part-II
www.sap.com
www.help.sap.com
www.scn.sap.com
www.service.sap.com

Assessment Pattern

<table>
<thead>
<tr>
<th>Assessment Questions</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remember</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>4 4 2</td>
<td>6 2</td>
<td>8</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2 2 2</td>
<td>2 2</td>
<td>2 4</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2 2 2</td>
<td>2 2</td>
<td>2 4</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2 2 2</td>
<td>6 6</td>
<td>4 4</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2 2 2</td>
<td>4 4 4 4</td>
<td>4 4</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
List the three key areas of SAP
List any four features of ABAP
List the five steps of ASAP methodology.
What is foreign key relationship?
What is the role of ICM in Application layer?
What are PBO and PAI events?
Write the Structure of work bench Request?
Explain the ABAP control structures with suitable example.
Explain the Conditional and Unconditional loop structures with suitable example
Illustrate the aggregate functions used in OPEN SQL with example

Understand
How does SAP Supports the maintenance Strategies in SAP Service?
How is conversion of data types done between ABAP/4 & external level?
Can we use flow logic control key words in ABAP/4 and vice-versa?
Which function module would you use to check the user’s authorization to access files before opening a file?

Which information system also enables you to search for objects by their attributes?

When an object that is already active is modified, it can affect other objects that use it directly or indirectly. What are the affected objects called as?

What type of buffering is advisable for tables that have frequent accesses to records that do not exist?

Which optimize the storage requirements and the access behavior of database tables?

Mention the advantage of pooled and cluster tables.

Discuss the elementary data types in ABAP.

Apply

Write a ABAP program to Income tax calculation using subroutine where salary, HRA, Incentives in income and Rent, LIC and loan in expenditure. Get the input through parameter and print the output in neat format using Write command.

Write a ABAP program to calculate the simple interest using parameters statement.

Write the structure of SELECT, INSERT and UPDATE SQL statements.

Data n1 type I value 10. Data n2 type I value 5. Perform add n1 n2. Write: / n1,n2.

Form add n1 n2

Data num1 type I.

Data num2 type i.


Endform.

What is the result of below code?

* do 7 times.
if sy-index = 4. Continue endif.
write sy-index. enddo

4 5 6 7
1 2 3 5 6 7
2 3
2

Data n1 type I value 10. Data n2 type I value 5. Perform add n1 n2. Write: / n1,n2.

Form add n1 n2

Data num1 type I.

Data num2 type i.

Num1 = n1. Num2 = n2. Num1 = num1 + 5.
Num2 = num2 + 5.
Endform.

Write an ABAP program to calculate the simple interest using the Subroutine by passing the Principal (P), Interest (I), Number of years (n) and return the amount to main program.
Write the steps in creating a function module through navigation. Explain with an example.
Write an open sql statements in the student database.

Write a ABAP function to prepare a grade sheet by getting the name ,rollno, 5 subjects mark for a student.

**Analyze**
- Differentiate R/2 and R/3 SAP system
- Differentiate data type and data object in ABAP
- Differentiate C and ABAP languages.
- Compare Local and Global data objects.
- Differentiate data element and domain
- Compare Open SQL and Native SQL
- Tabulate the types of Dialog messages in Error Handling.
- Compare and contrast transparent, cluster and pooled table
- Compare Conditional and Unconditional loop structures with suitable example

What is the result of below code?
* do 5 times.
  if sy-index = 5. continue.
  endif.
  write sy-index. enddo.

**Create**
Create a database for call taxi management system and create screen for booking and cancellation modules using functions.
Develop a simple application for students attendance maintenance system by considering present absent onduty and ML, apply subroutine to calculate the attendance percentage with respect to number of working days.

**Course Objectives**
Understand the components of Advanced Business Application Programming in business process.
Develop business applications based on requirements
To effectively use software for business development

**Course Outcomes (COs)**
Understand the objects oriented concepts in Advanced Business Application Programming
Develop the Business Applications for large scale industries based on Object Oriented Programming
Create business oriented web applications by integrating Advanced Business Applications Programming.
UNIT I  
FUNDAMENTALS OF OOABAP  

UNIT II  
INTERFACE AND EVENTS  
Interface and Casting: Local interfaces - Polymorphism using interfaces - Event handling: Events in local classes - Events in local interfaces - Repository objects: Global interfaces and global classes - Design patterns: Singleton pattern - factory classes using friendship - ABAP list viewer  

UNIT III  
EXCEPTION HANDLING AND MEMORY MANAGEMENT  
Class Builder - Raising exceptions - Advanced exception handling techniques - shared objects - Dynamic Programming: Generic data types - data objects - objects at run time.  

UNIT IV  
ENHANCEMENTS  

UNIT V  
WEB DYNPRO  

FOR FURTHER READING  

Total: 45 Hours  

Reference(s)  
ABAP workbench Part-III and Part-IV  
www. sap.com  
www. help.sap.com  
www.scn.sap.com  
www.service.sap.com  

Assessment Pattern  

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Assessment Questions

Remember

Describe ABAP objects
What are the diagrams that show different views of a system
What is meant by association?
List the three cardinalities in UML diagrams
Give an example for generalization and Specialization.
Data functions are kept separate in procedural programming language
say True
False
What does multiple instance means?
The diagram pays particular attention to the sequence in which
the objects relate to each other.
A. class

Object
When the main program calls a function module, only this function module is loaded
into the internal session.
Determine whether this statement is true or
false. A. True
False
Which one of the following syntax elements define the static
attributes? Choose the correct answer.
CLASS-DATA
DATA
LIKE

Understand

Explain the characteristics of Association.
What are the components in Sequence diagram?
Which of the following describes how instances of different classes respond differently
to the same messages?
Choose the correct answer.
Inheritance
Polymorphism
Encapsulation
Event control
The Garbage Collector is a system routine that starts automatically if the runtime
system does not have important tasks to carry out.
Determine whether this statement is true or false.
True
False
When calling a static method from within the class, you can omit the class
name. Determine whether this statement is true or false.
True
False
How to import Local classes and Inheritance?
Which of the following is a relationship in which the subclass inherits all the
main characteristics of the superclass?
how to Implement down-casts using inheritance. Explain with example
How classes are created for shared objects?
An object of the adapter class is instantiated by the call of the static
method GET_INSTANCE of the class CL_EXITHANDLER.
An object of the adapter class is instantiated by the call of the static method GET_INSTANCE of the class CL_EXITHANDLER.

**Apply**

1. Draw a UML class diagram for a student enrollment.
2. Create a UML class diagram for following classes and choose suitable cardinalities.
3. Create an executable program for airlines and their carriers having the attribute such as MV_name, MV_PlaneType, GV_N_O_Airplanes. Define public instance method SET_Attributes, Display_attributes, Display_N_O_airplanes.
4. Create an exception to invalid plane no and include a placeholder in the message text in airplane type.
5. What are the options for placing additional fields on a screen? Check 200 in transaction BC425_##. Add three fields to the screen: Pilot name, Meal, no of free spaces. Execute the program and check the result.
6. Create a new BADI on enhancement implementation on zbc427_##_sxBADI_SPOT, BADI implementation on class ZCL_BC427_##_NBD_SX.
7. Create simple UI elements of typeview in the layout view main edit its properties.
8. Create package znet_310_##. Assign application BC_WO ans software component home to your package. Create webdynpro component with window embedding a single view.
9. In context node controller create context node with name Flight info dictionary type sflight and has cardinality 1..1. Create same node in context of each view controller and map to Flight info carrier and conid.
10. Create the UI elements for student information system and correct the order of INPUT view in Element hierarchy.

**Analyse**

Differentiate between Procedural and object oriented Programming Language.
Differentiate Aggregation and Composition.
Differentiate Upcasting and Down Casting in Inheritance.
Discuss the access elements of classes in inheritance.
Differentiate Static type and dynamic type of reference variable.
Comparison Enhancement techniques customer exit, Business transaction events, Business ADD_ins with respect to program exit, menu exit, screen, append fields on screen, administration level, reusable, filter, specification.
Analyze Enhancement spots.
Differentiate Internal External visible WEB Dynpro Enties.
Differentiate implicit and explicit enhancement.
Discuss various types of Class based exception.

**Create**

Create an function module in banking application to perform withdraw and deposit.
Develop an application in object oriented ABAP to perform the operation involved in Employee pay roll system and their Apraisal report on every three months.

**Course Objectives**

Understand the systems, protocols and mechanisms necessary to support cloud computing.
Learn the services offered by cloud computing and their challenging security issues.

**Course Outcomes (COs)**

Use best practices in the design and development of elegant and flexible cloud software solutions.
Analyze the components of cloud computing showing how business agility in an organization can be created

Design and implement a novel cloud computing application

UNIT I
INTRODUCTION
Cloud computing at a glance - historical developments - building cloud computing environments - computing platforms and technologies - elements of distributed computing - technologies for distributed computing.

UNIT II
VIRTUALIZATION
Characteristics of virtualized environments - taxonomy of virtualization techniques - virtualization and cloud computing - technology examples.

UNIT III
CLOUD COMPUTING ARCHITECTURE
Cloud reference model - types of clouds - economics of the clouds - open challenges - organizational aspects.

UNIT IV
COLLABORATING USING CLOUD SERVICES
Email Communication over the Cloud - CRM Management - Project Management-Event Management - Task Management - Calendar - Schedules - Word Processing - Presentation - Spreadsheet - Databases - Desktop - Social Networks and Groupware.

UNIT V
SECURITY, STANDARDS AND APPLICATIONS

FOR FURTHER READING
Case study on Amazon, Google and IBM cloud services

Total: 45 Hours

Reference(s)


David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.

Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011


Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 4 2 4</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>2 2 2 2</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>4 4 6 4</td>
<td>6 6 6 4</td>
<td>6 6 6 4</td>
<td>6 6 6 4</td>
<td>6 6 6 4</td>
<td>6 6 6 4</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
Define Cloud Computing with example.
What are the properties of Cloud Computing?
What is the working principle of Cloud Computing?
Define Cloud services with example.
What are the advantages of cloud services?
What are the disadvantages of Cloud Computing?
What are the types of Cloud service development?
List the companies who offer cloud service development?
Mention the other Cloud service development tools.
What is precloud computing?

Understand
Draw the architecture of Cloud.
Why is Cloud Computing important?
Who get benefits from Cloud Computing?
Who shouldn’t be using Cloud Computing?
List the advantages and disadvantages of cloud service deployment.
What are the features of robust Cloud development? Who it offers?
Define the term web service with example.
What are the issues in web based applications?
What are the typical communication used in cloud computing?
Give the various schedules in Collaborating on schedule.

Apply
1. How cloud can be used in Event Schedules and Management with an example.
2. What is online collaboration in Collaborating on report?
3. How the online budgeting application can be accomplished?
4. Explain the activities on cloud computing for the corporation?
5. Discuss about the procedures used for Collaborating on calendars, Schedules and task management.
6. How could you make a transition from data center to cloud computing environment?
7. Why backup and recovery is needed for virtual machines (VMs)?
8. How can you develop cloud services in real time in Aneka?
9. How to develop cloud models suitable for different categories of users?
10. Use the procedures to create a spreadsheet application using cloud.
11. How can you develop cloud services in real time?

Analyse
Analyze the mapping schedules managing projects.
Explain in detail about Centralizing email communication.
Who shouldn’t use a Web-Based spreadsheet?
Develop a Hadoop Environment and generate a Map/Reduce Programming
Design Java Application to implement the Google AppEngine.
Study of Microsoft Azure and Google Apps Script.
Deploy a cloud in an organization of your choice. Also, explain the details.

Evaluate
Use Cloud Simulator Aneka Cloud with suitable application
What are the benefits of using cloud services? Also mention the difficulties faced by the users while using cloud services.
Enumerate the benefits of cloud computing when compared to traditional methods of storage. Explain with an appropriate example.

Create
Create a Cloud Based Software as a service(SAAS)
Create a customized virtualized Desktop applications.

15IT029 CLOUD MANAGEMENT ESSENTIALS

Course Objectives
Familiarize students with the practical aspects of IaaS (Infrastructure as a Service) cloud computing model
Familiarize students with the installation and configuration procedure of compute, storage and networking components of openstack platform
Familiarize students with python programming environment enable them to analyze openstack source code from github

Course Outcomes (COs)
Install and configure openstack components for managing cloud infrastructure
Manage cloud resources using Command Line Interface (CLI) and dashboard
Write scripts in python environment and analyze OpenStack implementation

UNIT I
OPENSTACK ENVIRONMENT

UNIT II
OPENSTACK COMPUTE AND NETWORKING
Compute service - Installing Nova with its API - Managing security groups - Networking service - Managing neutron services - VLAN Manager networking.

UNIT III
PYTHON SCRIPTING
Introduction to Python - Data type- Control Flow Tools - Function - module - File I/O - Classes - Exception Handling - Databases, Network services. Case Study: Glance API - Nova Compute

UNIT IV
DASHBOARD AND STORAGE CONFIGURATION
Dashboard Service - Horizon Installation - GUI Management and Maintenance - Block Storage Component - Cinder - Snapshot management
UNIT V
ORCHESTRATION AND TELEMETRY SERVICES
Orchestration service - Telemetry service- Launch VM instances

FOR FURTHER READING
Containers and Docker Services

Total: 45 Hours

Reference(s)
Dan Radez, OpenStack Essentials, PackT publishing, 2015
docs.openstack.org

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td>F  C  P  M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2  2  8  8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>4  4  8  8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>6  6  8  8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>8  12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>5  5  10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
How do you list the OpenStack services and their end points from command prompt of controller node? Illustrate with necessary commands.
What exactly happens when you source keystonerc_admin file from the command prompt?
Define logical volume manager (LVM) in linux environment.
State the steps involved in enabling root access via ssh.
List the functionality of publicurl, Internalurl and adminurl parameters of compute service API endpoints.

Understand
Differentiate between the two network modes available in the openstack environment with respect to the network design aspects.
Why is LVM (Logical Volume Manager) preferred when compared to Manual Partitioning?
Differentiate between glance-api and glance-registry components of OpenStack image service.
While installing glance, inorder to populate image service database we issue ` su -s /bin/sh -c "glance-manage db_sync" ' command. Interpret the su, /bin/sh and glance_manage.
Differentiate between OpenStack networking plug-ins and agents.

Apply
Illustrate how SNAT allows traffic from private network to go out to the internet.
How do we upload an image to OpenStack image service with public visibility to enable access to all projects? Provide the necessary command.
How do you ensure that nova-conductor, nova-console and nova-scheduler components are successfully registered and enabled? Provide the necessary commands.
How do you determine whether your compute node support hardware acceleration for virtual machines?
What are iptables? How to install iptables on ubuntu server?
Analyse

Object storage (swift) of openstack environment, to the extent possible, stores the replica of a data in different zones rather than on a same zone. Why is it so?

Ceilometer uses mongoDB database to store telemetry data and it is generally preferred to configure mongoDB to store data in a separate partition rather than on a root disk. Why is it so?

Operating system kernel images are in most cases files residing on appropriate file systems, but the concept of a file system is unknown to the BIOS. Thus, in BIOS-based systems, the duty of a boot loader is to access content of those files, so it can be read from the hard disk, loaded into the RAM, and executed. One of the possible approaches for boot loaders is to load the kernel images by directly accessing hard disk sectors occupied by the actual kernel image, without understanding the underlying file system. Another approach is to make a boot loader aware of the underlying file systems, so kernel images are configured and accessed using their actual file paths. Compare these two approaches and explain the approach used by the GRUB.

Assume that you are the manager of an enterprise and you task is to choose between cloudstack and openstack for private cloud deployment. How would you go about choosing the right technology

Create

Identity the scheduler part of nova from its source code and implement a new scheduling algorithm by modifying the nova code.

Analyze the hashing algorithm used in openstack object storage and implement a new algorithm which would improve the data retrieval efficiency for geographically distributed storage systems.

15IT030 ENTERPRISE SYSTEM PROGRAMMING

Course Objectives

Familiarize students with technology and programming platform for developing software systems
Enable students to design databases and carry out coding design for the development of enterprise software systems.
Enable students to maintain large scale software systems by analyzing existing codings and incorporating change requirements

Course Outcomes (COs)

Develop software systems using java, javascript libraries and integrate with public clouds
Design and implement Admin, HR and Production modules of enterprise software systems
Maintain large scale software systems by analyzing existing codings and incorporating change requirements

UNIT I

PROGRAMMING BASICS

UNIT II

ADMIN MODULE
Defining Roles, Role Management, User Management, User Activity Tracking, Design and implementation
UNIT III  
HR MODULE  
Employee Management, Leave Management, Time and Attendance Management, Payroll Management, HR Reporting, Design and Implementation  

UNIT IV  
MATERIAL MANAGEMENT AND ACCOUNTING MODULE  
Introduction to financial accounting, Design of accounting systems, Stores management system design, inventory and stock management  

UNIT V  
PRODUCTION MODULE  
Defining Production Process for Academics, Curriculum, Time Management, Attendance Management, Performance Management, Design and Implementation  

FOR FURTHER READING  
Cloud based enterprise systems  

Total: 45 Hours  

Reference(s)  
- Alan W. Brown, Enterprise Software Delivery, Addison Wesley, Jun 2012  
- Baron Schwartz, Peter Zaitsev, and Vadim Tkachenkom, "High Performance Mysql", by O'Reilly Media, 2012  

Assessment Pattern  

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 2</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>2 4</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td></td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td></td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions  

Remember  
List the benefits of using openID based authentication for enterprise software systems.  
State the usage of http-equiv attribute of html meta tag.  
What are character encodings? Why UTF-8 is preferred as default character encoding?  
What is a scriptlet in JSP and write its syntax?  
What are the advantages of using jquery over java scripts in a java server page?  

Understand  
Differentiate between GET method and POST method of HTTP protocol.  
Differentiate between getParameter, getParameterValues and getParameterNames methods of request object.
How to select elements using jQuery with the given element tag-name? Give example coding.

How are activities, roles and users related to each other? Illustrate with a neat sketch.

Apply

How are session variables established in java servlets? Illustrate with code snippets.

After deploying the system in production environment, any change in database password should not require re-deployment / re-compiling. How to adhere to this requirement?

People with different roles will have different startup / welcome page. How is this feature implemented in admin module?

Analyse

List the different methods of storing user passwords and compare them with respect to security and privacy.

The more flexibility you have, the more errors or bad practices you can made. High flexibility works only with highly intelligent programmers, others will turn the project into unmanageable nightmare. Relate this statement to JSF, JSP/Servlet and jQuery / Javascript.

Analyze the pros and cons of adopting the MVC design pattern for your application based on JSP and doing away with JSF.

Evaluate

Assume that you need to design a table to store the payroll data of employees and currently you requirement document contains the following heads under the salary: BASIC, DA, HRA, PPF, IT_DEDUCTION. There are two ways to design the table as given below.

Solution1: Define a table with BASIC, DA, HRA, PPF, IT_DEDUCTION as its columns.

Solution2: Define a table with BASIC, DS, HRA, PPF, IT_DEDUCTION as rows (records) and design another table to store the values.

Compare these two approaches with respect to change request and code maintenance.

Create

Identify the different core entities that are required for designing a schema for employee attendance managment system and explain the relationship between them with the help of a neat sketch. Also illustrate how your design is adaptable to possible change requests. The design should incorporate shift, regular and other categories of work timings.
ENTREPRENEURSHIP ELECTIVES

15GE001 ENTREPRENEURSHIP DEVELOPMENT I 3 0 0 3

Course Objectives
Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.

Course Outcomes (COs)
Able to gain Knowledge about entrepreneurship, motivation and business.
Able to develop small scale industries in different field.

UNIT I 9 Hours
BASICS OF ENTREPRENEURSHIP
Nature, scope and types of Entrepreneurship, Entrepreneur Personality Characteristics, Entrepreneurship process. Role of entrepreneurship in economic development

UNIT II 9 Hours
GENERATION OF IDEAS
Creativity and Innovation, Lateral Thinking, Generation of Alternatives, Fractionation, Reversal Method, Brain Storming, Analogies

UNIT III 9 Hours
LEGAL ASPECTS OF BUSINESS

UNIT IV 9 Hours
BUSINESS FINANCE
Project evaluation and investment criteria (cases); sources of finance; financial statements; break even analysis, cash flow analysis.

UNIT V 9 Hours
OPERATIONS MANAGEMENT
Importance- functions-deciding on the production system- facility decisions: plant location, plant layout (cases), capacity requirement planning- inventory management (cases)-lean manufacturing, Six sigma.

FOR FURTHER READING
Role of social networking sites in business

Total: 45 Hours

Reference(s)
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

What is entrepreneurship?
What are the factors that motivate people to go into business?
Define a small-scale industry
Who is an intrapreneur?
State functions of SISI
What is serial entrepreneur?
What is Technopreneurship?
What is reversal method?
What is brainstorming?
What do you mean by term business idea?
Mention any two schemes Indian government provides to the development of entrepreneurship
What is a project report?
What is project scheduling?
Mention any four techniques available for project scheduling.
What is contract act?
Define MOU.
Mention any five external sources of finance to an entrepreneur.
Classify the financial needs of an organization
Why is motivational theories important for an entrepreneur?

Understand

Why is entrepreneurship important of growth of a nation?
Mention the essential quality required for someone to be an entrepreneur.
How is network analysis helpful to the development of an entrepreneur?
Mention the essential requirements for a virtual capital.
How under-capitalization affects an entrepreneur
Mention the causes of dissolution of a firm.
How important is the support of IDBI to an entrepreneur?
What are the salient features of New Small Enterprise Policy, 1991?
Why scheduling is very important for a production design?

Apply

If you want to become as an entrepreneur, what will be your idea?
Select any one of the creative idea generation method and suggest an innovation that you can implement in your business.
Write a short notes on various legal aspects that you have to consider to run you business.
How will you generate your capital and other financial supports?
In case of getting enough financial support, plan your business and plot the various stages using any of the tools or techniques

Create

Draft a sample project report for your business
Do a network analysis using PERT and CPM for your business plan.
Write a brief report to apply to a financial organization for seeking financial support to your business

15GE002 ENTREPRENEURSHIP DEVELOPMENT II 3 0 0 3

Course Objectives

Evolve the marketing mix for promoting the product / services
Handle the human resources and taxation
Understand Government industrial policies / support provided and prepare a business plan

Course Outcomes (COs)

1. Increase in awareness of the entrepreneurship Development for engineering decisions.

UNIT I
MARKETING MANAGEMENT
Marketing environment, Segmentation, Targeting and positioning, Formulating marketing strategies, Marketing research, marketing plan, marketing mix (cases)

UNIT II
HUMAN RESOURCE MANAGEMENT
Human Resource Planning (Cases), Recruitment, Selection, Training and Development, HRIS, Factories Act 1948 (an overview)

UNIT III
BUSINESS TAXATION
Direct taxation, Income tax, Corporate tax, MAT, Tax holidays, Wealth tax, Professional tax (Cases). Indirect taxation, Excise duty, Customs, Sales and Service tax, VAT, Octroi, GST (Cases)

UNIT IV
GOVERNMENT SUPPORT
Industrial policy of Central and State Government, National Institute-NIESBUD, IIE, EDI. State Level Institutions-TIIC, CED, MSME, Financial Institutions

UNIT V
BUSINESS PLAN PREPARATION
Purpose of writing a business plan, Capital outlay, Technical feasibility, Production plan, HR plan, Market survey and Marketing plan, Financial plan and Viability, Government approvals, SWOT analysis.

FOR FURTHER READING
Ethics in Entrepreneurship

Total: 45 Hours
Reference(s)
http://niesbud.pathak.in/agencies.html

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
Who are Fabian Entrepreneur?
Mention the three functions of NSIC?
Narrate the role of IDBI in the development of Entrepreneurship?
What are the stages in a Project Lifecycle?
Give the meaning of Feasibility Report
What is Motivating Training?
Who is a Small Scale Entrepreneur?
How to develop Rural Entrepreneur?
What are the Social Problems of Women Entrepreneur?
What are the types of entrepreneurs?
List the various qualities of entrepreneur.
What is entrepreneurship training?
State the role of NISIET.
List the challenges and opportunities available in SSI’s?

Understand
What are the elements of EDP?
How would you Classify Projects?
What is the role played by commercial banks in the development of entrepreneur?
What are the target groups of EDP?
What are the major problems faced by Small Entrepreneur?
What are the problems & prospects for women entrepreneur in India?

Apply
Describe the various functions performed by Entrepreneurs?
Explain the role of different agencies in the development of Entrepreneur?
Discuss the criteria for selecting a particular project?
Describe the role of Entrepreneur in the Development of Country?
Define business idea. Elaborate the problems and opportunities for an entrepreneur.
Elaborate the schemes offered by commercial banks for development of entrepreneurship.
Explain the significant role played by DIC & SISI for the development of entrepreneurship.

**Analyse**
1. Differentiate between entrepreneur and entrepreneurship
2. What are the problems of Women entrepreneurs and discuss the ways to overcome these barriers?
3. Discuss the importance of small scale industries in India

**Evaluate**
Review the entrepreneurial growth by the communities of south India.
Critically examine the growth and development of ancillarisation in India.

**Create**
Design a short entrepreneurship development programme for farmers.
"All economy is the effect for which entrepreneurship is the cause". Discuss.
Discuss the various sources and collection of credit information of entrepreneurs
Discuss the role of the government both at the Central and State level in motivating and developing entrepreneurship in India.
Briefly explain the recommendation and policy implication for survival of SME's.
Developing countries like India need imitative entrepreneurs rather than innovative entrepreneurs”. Do you agree? Justify your answer with examples.
Discuss the “Culture of Entrepreneurship” and its role in economic development of a nation.
What factors contribute to nurturing such a culture?

**PHYSICAL SCIENCE ELECTIVES**

**15GE0C1 CORROSION SCIENCE**

**Course Objectives**
- Recognize the terminologies used in corrosion science.
- Impart knowledge about the various types of corrosion and its mechanism.
- Understand the various methods of corrosion control, corrosion testing and monitoring.

**Course Outcomes (COs)**
- Familiarize with the fundamentals of corrosion science.
- Understand the types of corrosion and role of chemistry behind corrosion of metals.
- Develop their ability to identify, formulate and solve corrosion based problems.
- Calculate the corrosion rate using different methods.
- Analyze the analytical part of corrosion science which gives contextual knowledge to their higher research programmes.

**UNIT I**

**CORROSION**
Importance of corrosion - spontaneity of corrosion - passivation - direct and indirect damage by corrosion - importance of corrosion prevention in industries - area relationship in both active and passive states of metals - Pilling Bedworth ratio and its significance - units of corrosion rate (mdd and mpy) - importance of pitting factor - Pourbaix digrams of Mg, Al and Fe and their advantages and disadvantages.

**UNIT II**

**TYPES OF CORROSION**
UNIT III  
MECHANISM OF CORROSION  

9 Hours  

Hydrogen embrittlement - cracking - corrosion fatigue - filliform corrosion - fretting damage and microbes induced corrosion - corrosion mechanism on steel, iron, zinc and copper metal surfaces - thick layer and thin layer scale formation - in situ corrosion scale analysis.

UNIT IV  
CORROSION RATE AND ITS ESTIMATION  

10 Hours  

Rate of corrosion: factors affecting corrosion - electrochemical methods of polarization - Tafel extrapolation polarization, linear polarization, impedance techniques - weight loss method - susceptibility test - testing for intergranular susceptibility and stress corrosion. Visual testing - liquid penetrant testing - magnetic particle testing - eddy current testing.

UNIT V  
CORROSION CONTROL METHODS  

10 Hours  


FOR FURTHER READING  
Corrosion issues in supercritical water reactor (SCWR) systems.  

Total: 45 Hours  

Reference(s)  
http://corrosion-doctors.org/Corrosion-History/Eight.htm

Assessment Pattern  

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1 2 2</td>
<td>1 2 1</td>
<td>1 1 1</td>
<td>1 1 2</td>
<td>2 1 1</td>
<td>1 1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>1 3 1</td>
<td>2 1 1</td>
<td>2 2 1</td>
<td>2 1 1</td>
<td>1 1 1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>2 1 1</td>
<td>1 4 1</td>
<td>3 1 1</td>
<td>2 2 1</td>
<td>2 1 1</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>1 1 1</td>
<td>2 3 1</td>
<td>2 2 1</td>
<td>2 1 1</td>
<td>1 2 1</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>1 2 1</td>
<td>1 2 1</td>
<td>2 3 1</td>
<td>2 3 1</td>
<td>1 2 1</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions  

Remember  

Define Corrosion  

Mention the five types of corrosion
Define dry corrosion. Explain the mechanism.
What are corrosion inhibitors? Give two examples.
What are corrosion inhibitors? Give two examples.
Write the working principle of Tafel polarization techniques.
How polarization and impedance techniques are used to measure the corrosion products?
Define cathodic protection.

evaluate non-electrochemical and electrochemical methods of corrosion testing and monitoring.

What is Tafel linear polarization?
What is Tafel linear polarization?

Understand

Explain the mechanism of electrochemical corrosion.
Identify the relation between the two units used to measure corrosion rate.
Illustrate the Pourbaix diagrams of Mg/Al/Fe and their limitations.
List the eight forms of corrosion. Explain each type with an example.
What are the factors influencing the corrosion rate? Explain.
Discuss the Pilling-Bedworth rule.
Differentiate between electrochemical and dry corrosion.
How inhibitors are used to protect the corrosion rate of the metal? Explain.
What are consequences of Pilling-Bedworth ratio?
List the difference between filliform corrosion and pitting corrosion.

Apply

Area relationship between the anodic and cathodic part in galvanic corrosion. Discuss.
Describe alternatives to protective coatings.
How Tafel polarization and impedance techniques used to measure the corrosion products?

Analyse

Explain why corrosion rate of metal is faster in aqueous solution than atmosphere air?
Why pitting corrosion is localized corrosion? Explain.
Compare the effects of corrosion products.
Identify different forms of corrosion in the metal surface.
What are the major implications of enhanced techniques of corrosion product analysis?

15GE0C2 ENERGY STORING DEVICES AND FUEL CELLS

Course Objectives
Understand the concept, working of different types of batteries and analyze batteries used in electric vehicles.
Identify the types of fuel cells and to relate the factors of energy and environment.
Analyze various energy storage devices and fuel cells.

Course Outcomes (COs)
Understand the knowledge of various energy storing devices.
Acquire the knowledge to analyze the working of different types of primary and secondary batteries.
Differentiate the types of fuel cells and recognize the utility of hydrogen as a fuel.

Realize the importance of using green fuel for sustainable development.

UNIT I 
BASICS OF CELLS AND BATTERIES
Components - classification - operation of a cell - theoretical cell voltage - capacity - specific energy - energy density of practical batteries - charge efficiency- charge rate - charge retention - closed circuit voltage, open circuit voltage current density - cycle life - discharge rate-over charge-over discharge.

UNIT II 
BATTERIES FOR PORTABLE DEVICES AND ELECTRIC VEHICLES
Primary batteries- zinc-carbon, magnesium, alkaline, manganous dioxide, mercuric oxide, silver oxide batteries - recycling/safe disposal of used cells. Secondary batteries - introduction, cell reactions, cell representations and applications - lead acid, nickel-cadmium and lithium ion batteries - rechargeable zinc alkaline battery. Reserve batteries: Zinc-silver oxide, lithium anode cell, photogalvanic cells. Battery specifications for cars and automobiles.

UNIT III 
TYPES OF FUEL CELLS
Importance and classification of fuel cells - description, working principle, components, applications and environmental aspects of the following types of fuel cells: alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate and direct methanol fuel cells.

UNIT IV 
HYDROGEN AS A FUEL

UNIT V 
ENERGY AND ENVIRONMENT

FOR FURTHER READING
Energy conservation, Over utilization, Energy demanding activities.

Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2 2 1 2</td>
<td>1 2 1 3 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>4 1 4 5</td>
<td>2 1 1 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>3 4 5 1</td>
<td>1 4 2 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>1 2 4 1</td>
<td>1 2 4 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>2 2 2 1</td>
<td>2 3 3 3 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember

- How galvanic cell is differing from electrolytic cell?
- How is the potential of an electrochemical cell calculated?
- List any four characteristics of primary batteries.
- Mention any two characteristics and applications of zinc-carbon battery.
- Recognize any two applications and characteristics of primary magnesium batteries.
- Identify the applications and characteristics of Zn/HgO primary batteries.
- Indicate any two applications of Zn/alkaline/MnO2 battery.
- Mentioned any two applications of Zn/Ag2O primary battery.
- Define capacity of a cell
- Define discharge rate of a battery.
- Describe the construction, cell reaction and applications of zinc-carbon battery.
- Explain the construction, chemistry, advantages and uses of mercuric oxide battery.
- Explain the major components and reaction of direct methanol fuel cell. List two applications.
- Explain the working principle, components and applications of alkaline fuel cells
- Discuss the conversion of sunlight into electrical power in photoelectrochemical cells.

Understand

- Mention the five different types of energy storage devices
- Define the term battery
- List any two differences between battery and cell.
- Mention the three major components of cell.
- Classify the batteries based on their cell reversibility.
- Define cycle Life of a cell.
- Explain the construction, cell reaction and applications of silver oxide batteries.
- With a neat sketch explain the construction and working of phosphoric acid fuel cell.
- Explain the major components and reactions of direct methanol fuel cell
- Explain the production of hydrogen photobiochemical conversion cell.

Apply

- Specific gravity is an indicator of charge in lead acid battery – Justify.
- Illustrate the process of water electrolysis for the production of hydrogen.
- How is the potential of an electrochemical cell calculated?
- How is the potential of an electrochemical cell calculated?

Analyse

- In the mid-winter car battery is not working – reason out.
- Discuss the hydrogen energy strategies for sustainable development.
- How galvanic cell is differing from electrolytic cell?
- How batteries are rated?
5. Differentiate between primary and secondary batteries.

15GE0C3 POLYMER CHEMISTRY AND PROCESSING

Course Objectives

- Impart knowledge on the basic concepts of polymers and its mechanism
- Use the appropriate polymerization techniques to synthesize the polymers and its processing
- Select the suitable polymers for various applications

Course Outcomes (COs)

- Understand the basic concepts of polymer chemistry and mechanism of polymerization reactions
- Acquire knowledge of polymerization techniques
- Identify the structural, mechanical and electrical features of polymers
- Apply the polymer processing techniques to design polymer products
- Realize the applications of specialty polymers

UNIT I

POLYMERS AND ELASTOMERS


UNIT II

POLYMERIZATION TECHNIQUES

Homogeneous and heterogeneous polymerization - bulk polymerization (PMMA, PVC) solution polymerization - polyacrylic acid, suspension polymerization (ion-exchange resins) - emulsion polymerization (SBR) - advantages and disadvantages of bulk and emulsion polymerization. Melt solution and interfacial poly-condensation.

UNIT III

CHARACTERIZATION AND TESTING

Characterization of polymers by Infrared Spectroscopy (IR) and Nuclear Magnetic Spectroscopy (NMR) - Thermal properties by TGA and DSC, Testing tensile strength, Izod impact, Compressive strength, Rockwell hardness, Vicot softening point. Test for electrical resistance, dielectric constant, dissipation factor, arc resistance and dielectric strength - water absorption.

UNIT IV

POLYMER PROCESSING


UNIT V

SPECIALITY POLYMERS

FOR FURTHER READING
Biodegradable polymers

Total: 45 Hours

Reference(s)
Joel R. Fried, Polymer Science and Technology, Prentice Hall of India (P). Ltd., 2014
George Odian, Principles of Polymerization, John Wiley & Sons, New York, 2004

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
Recall two factors that govern termination of cationic polymerization.
Identify the monomers used in styrene - butadiene rubber.
Give an examples for the thermosetting and thermoplastic polymers.
What is copolymerization? Give an example.
Name two synthetic polymers which are used for making textile fibres.
Define the role of Ziegler – Natta catalysts.
List the examples of Ziegler – Natta catalysts.
Identify the four types of polymerization technique.
List any two disadvantages of suspension polymerization.
Point out the advantages of bulk polymerization technique.
Why does natural rubber need compounding?
List any four applications of injection moulding process.
List the various additives in processing of plastics.
List the two properties of heat resistant polymers.
Mention the application of flame retardant polymers.

Understand
Classify the polymers based on source.
Discuss the addition and chain growth polymerization with example.
Compare addition and condensation polymerization reaction with example for each type.
Explain homogeneous and heterogeneous polymerization.
Explain the mechanism involved in addition polymerization of vinylChloride.
Explain the condensation polymerization method taking nylon 6,6, nylon synthesis as a representative example.
Discuss the preparation method and any three properties of Polysulphone.
Summaries the salient features, advantages and disadvantages of bulk and emulsion polymerization techniques.

Compare the homogeneous and heterogeneous polymerization method.

With a neat sketch, discuss the functioning of melt, dry and wet spinning process.

Illustrate the compression and extrusion moulding of plastics with diagram neat diagram.

Explain the coordination polymerization mechanism using a suitable example.

**Apply**

Relate the various steps involved in anionic and cationic polymerisation using suitable examples.

Select the suitable polymerization techniques for synthesis of PMMA and SBR

Assess the characterisation techniques used to find the structure of polymer .

Find the method to process the composite materials with example.

Execute the filament – winding Technique for manufacturing of rocket motor bodies.

**Analyse**

Distinguish between addition and condensation polymerisation.

Natural rubber need vulcanization –Justify.

Compare the salient features, advantages and disadvantages of solution and suspension polymerization techniques.

Bring out the differences between thermoforming and vacuum-forming process.

Outline the applications of polymer in controlled drug delivery and artificial organs.

**Evaluate**

Judge the biomedical applications of polymers in Hemo dialysis and hemo filtration.

Choose the suitable moulding Technique for polyvinyl chloride.

### 15GE0P1 NANOMATERIALS SCIENCE 3 0 0 3

**Course Objectives**

Understand the fundamentals of physics of nanomaterials

Correlate on multidisciplinary branch

Acquire the knowledge in nanomaterials synthesis, compile and analyze data and draw conclusions at nano level

**Course Outcomes (COs)**

Categorize nanomaterials based on their properties

Design different experimental methods for preparation of nanomaterials

Infer the working mechanism of different characterization instruments as well as analyses and interpret data

Know the different techniques for making nano semiconducting materials and utilize them for applications

Understand the impact of nanomaterials and their applications in nanodevices

### UNIT I

**NANO SCALE MATERIALS**

Introduction-Feynman's vision-national nanotechnology initiative (NNI) - past, present, future - classification of nanostructures,nanoscale architecture - effects of the nanometer length scale - changes to the system total energy, and the system structures- effect of nanoscale dimensions on various properties -magnetic properties of nanoscale materials -differences between bulk and nanomaterials and their physical properties.
UNIT II
NANOMATERIALS SYNTHESIS METHODS
9 Hours
Top down processes - mechanical milling, nanolithography and types based on radiations - Bottom up process - chemical vapour deposition, plasma enhanced CVD, colloidal and sol-gel methods - template based growth of nanomaterials - ordering of nanosystems, self-assembly and self-organization - DC sputtering and RF sputtering process.

UNIT III
CHARACTERIZATION TECHNIQUES
9 Hours

UNIT IV
SEMICONDUCTOR NANOSTRUCTURES
9 Hours

UNIT V
NANOMACHINES AND NANODEVICES
9 Hours
Microelectromechanical systems (MEMS) and Nanoelectromechanical systems (NEMS)-fabrication, actuators-organic FET- principle, description, requirements, integrated circuits- organic LEDâ??s - basic processes, carrier injection, excitons, optimization - organic photovoltaic cells-nano motors -bio nano particles-nano - objects - applications of nano materials in biological field.

FOR FURTHER READING
Application of graphene in various field - supercapacitors - third generation solar cell-dye sensitized solar cell (DSSC) -fuel cells.

Total: 45 Hours
Reference(s)
Robert W. Kelsall, Ian W. Hamley, Mark Geoghegan, Nanoscale Science and Technology, John Wiley and Sons Ltd, 2006
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3 4 4 4</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>2 3 4 4</td>
<td>4 4</td>
<td>3</td>
<td>4</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>2 4 2 2</td>
<td>2 2</td>
<td>2 2</td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2 4 2</td>
<td>2 4</td>
<td>3</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>2 4</td>
<td>3 2</td>
<td></td>
<td>4</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Assessment Questions

**Remember**
- Explain the term nano
- List three types of classifications of nanomaterials.
- Recall the principle behind lithography.
- Define top-down and bottom-up approach.
- Name two types of nanoarchitecture
- Define nanocomposites.

**Recall the principle of electron microscopy.**
- List 5 characterization techniques in nanotechnology.

**Define quantum well and quantum wire.**
- Write the allotropy of carbon.

**Understand**
- Explain the effect of nanometer length scale.
- Can affect the system total energy when particle size reduced? Justify.
- Explain plasma enhanced CVD.
- Identify the difference between self-assembly and self-organization.
- Name 3 synthesis process under bottom-up approach.
- Explain contact mode in AFM.
- Is it possible to explain the entire details of the sample by taking one characterization technique? if no, justify.

**Apply**
- Find three day to day live commercial application of nanotechnology?
- Choose two template methods used to obtain nanowire or nanorods.
- Construct the experimental setup for organic LED.
- Find 4 industrial applications of CNT.

**Analyze**
- Differentiate between bulk and nanomaterials.
- Identify the roll of nanoparticles in biological field.
- Distinguish between glow discharge and RF sputtering.
- Criticize the future challenges for nanotechnology?

**Evaluate**
- 1. Nanomaterials, do they exist in nature? If yes, Identify the nanomaterials and recognize.

15GE0P2 SEMICONDUCTOR PHYSICS AND DEVICES

Course Objectives
- Impart knowledge in physical properties of semiconducting materials
- Analyze the factors affecting the operation of semiconductor devices
- Apply the physics of semiconductors to develop semiconductor devices
Course Outcomes (COs)

- Exemplify the transport properties of semiconductors
- Understand the physics of PN junction
- Analyze the factors affecting the properties of PN junction diode
- Demonstrate the geometry and operation of bipolar junction Transistors
- Summarize the optical properties and design of optoelectronic devices

UNIT I 9 Hours
CARRIER TRANSPORT IN SEMICONDUCTORS
Carrier drift - drift current density - mobility effects on carrier density - conductivity in semiconductor
carrier transport by diffusion - diffusion current density - total current density - breakdown phenomena - avalanche breakdown.

UNIT II 9 Hours
PHYSICS OF P-N JUNCTION
Basic structure-Built in potential barrier, Electric field and space charge width of P-N junction under zero, forward and reverse bias - Diffusion capacitance - one sided and linearly graded junctions.

UNIT III 9 Hours
P-N JUNCTION DIODE
Qualitative description of charge flow in p-n junction - boundary condition - minority carrier distribution - ideal p-n junction current - temperature effects - applications - the turn on transient and turn off transient.

UNIT IV 9 Hours
BIPOLAR JUNCTION TRANSISTOR
Introduction to basic principle of operation - the modes of operation - amplification - minority carrier distribution in forward active mode - non-ideal effects - base with modulation - high injection emitter band gap narrowing - current clouding - breakdown voltage - voltage in open emitter configuration and open base configuration.

UNIT V 9 Hours
OPTO ELECTRONIC DEVICES
Optical absorption in a semiconductor, photon absorption coefficient - electron hole pair generation - solar cell - homo junction and hetero junction - Photo transistor - laser diode, the optical cavity, optical absorption, loss and gain - threshold current.

FOR FURTHER READING
Organic semiconductors- diodes - transistors-working and applications

Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3 4 4 2</td>
<td>2</td>
<td>2 C P M</td>
<td>2 C P M</td>
<td>2 C P M</td>
<td>2 C P M</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>2 3 4 4</td>
<td>4 4</td>
<td>3 C P M</td>
<td>3 C P M</td>
<td>3 C P M</td>
<td>3 C P M</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>2 4 2 2</td>
<td>2 2</td>
<td>4 C P M</td>
<td>4 C P M</td>
<td>4 C P M</td>
<td>4 C P M</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2 2 4 4</td>
<td>2 2</td>
<td>2 C P M</td>
<td>2 C P M</td>
<td>4 C P M</td>
<td>4 C P M</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>2 4 2 2</td>
<td>2 2</td>
<td>4 C P M</td>
<td>4 C P M</td>
<td>4 C P M</td>
<td>4 C P M</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
- Define drift current density
- Recall diffusion capacitance
- Write the ideal diode equation
- List the three modes of transistor operation
- State the principle of solar cell

Understand
- Identify the two scattering mechanisms that affect mobility of charge carriers in semiconductors
- Sketch the energy band diagram of a P-N junction under thermal equilibrium
- Exemplify the boundary conditions used to calculate minority carrier distribution in a junction diode
- Explain the base width modulation occur in transistors
- Illustrate the working mechanism of a phototransistor

Apply
- By applying the concept of scattering, explain the mobility of holes in a semiconductor.
- Apply Poisson equation to space charge region and hence derive the electric field under zero bias.
- Show that the minority carrier concentrations in a diode decay exponentially with distance away from the junction to their thermal-equilibrium values.
- Derive an expression for excess minority current in the emitter region under forward action mode by applying the ambipolar transport equation.
- Show that the minority carrier concentrations in a diode decay exponentially with distance away from the junction to their thermal-equilibrium values.

Analyse
- Differentiate drift current and diffusion current
- Space charge width increases upon reverse bias. Justify
- Silicon is preferred over germanium for the manufacture of semiconductor devices. Justify
- Compare emitter bandgap narrowing and current crowding.
- Differentiate homojunction and heterojunction laser

Course Objectives
- Impart knowledge on laser science
- Explore different strategies for producing lasers
- Create expertise on the applications of lasers in various fields
Course Outcomes (COs)

Realize the concept of stimulated emission and apply the same for laser oscillation
Understand the properties laser and working of different laser systems
Determine the rotation of earth, velocity and distance using lasers and apply the same for day today applications
Design the different laser based instrumentation for medical field
Summarize the applications of lasers in industry

UNIT I
LASER FUNDAMENTALS
9 Hours

UNIT II
CHARACTERISTICS AND TYPES OF LASERS
9 Hours

UNIT III
LASERS IN SCIENCE
9 Hours
Harmonic generation - stimulated Raman emission - lasers in chemistry - laser in nuclear energy - lasers and gravitational waves - LIGO - rotation of the earth - measurement of distance - velocity measurement - holography.

UNIT IV
LASERS IN MEDICINE AND SURGERY
9 Hours

UNIT V
LASERS IN INDUSTRY
9 Hours

FOR FURTHER READING
Q-switching - mode locking - thermo-optic effects - astronomy lasers - fighting crime with lasers - laser engraving.

Total: 45 Hours

Reference(s)

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 F 2 C 1 P M</td>
<td>2 F 2 C 1 P M</td>
<td>2 F 3 C 1 P M</td>
<td>2 F 1 C 1 P M</td>
<td>1 F 2 C 1 P M</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>2 F 2 C 1 P M</td>
<td>3 F 2 C 2 C P M</td>
<td>2 F 2 C 1 P M</td>
<td>1 F 1 C 1 P M</td>
<td>1 F 2 C 1 P M</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>3 F 2 C 1 P M</td>
<td>2 F 2 C 2 C P M</td>
<td>2 F 3 C 1 P M</td>
<td>2 F 1 C 1 P M</td>
<td>1 F 2 C 1 P M</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>2 F 2 C 1 P M</td>
<td>2 F 1 C 1 P M</td>
<td>2 F 2 C 1 P M</td>
<td>2 F 1 C 1 P M</td>
<td>1 F 2 C 1 P M</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>2 F 1 C 1 P M</td>
<td>3 F 2 C 1 P M</td>
<td>2 F 2 C 1 P M</td>
<td>1 F 2 C 1 P M</td>
<td>3 F 1 C 1 P M</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

Remember
- Recognise the term LASER
- Define stimulated absorption
- Define spontaneous emission
- Define stimulated emission
- Distinguish between spontaneous and stimulated emission
- State population inversion
- List the four characteristics of lasers
- Mention the five medical applications of lasers
- State the principle behind the holography
- Recall the term resonant cavity

Understand
- Identify the condition needed for laser action
- Interpret the pumping of atoms
- Exemplify the optical excitation occurs in three level laser systems
- Explain the determination of rotation of earth using laser
- Summarize the application of lasers in welding and cutting
- Explain the term LASIK
- Classify the different types of lasers based on materials
- Illustrate the working of laser in material processing

Apply
- Predict the condition for laser action
- Derive the Einstein’s A and B coefficients
- Deduce the expression for large stimulated emission
- Construct the experimental setup for distance measurement
- Find the applications of lasers in stimulated Raman
- Assess the wavelength of emission of GaAs semiconductor laser whose bandgap energy is 1.44 eV.

Analyse
- Laser beam should be monochromatic, Justify?
- Differentiate ordinary light source from laser source
- Compare the working of gas lasers with excimer laser

Evaluate
- Four level laser systems are more efficient than three level laser systems. Justify?
- Determine the intensity of laser beam be focused on an area equal to the square of its wavelength. For He-Ne laser wavelength is 6328 Å and radiates energy at the rate of 1mW. Choose the appropriate lasers for the materials processing in industry
OPEN ELECTIVES

15IT0YA DATABASE MANAGEMENT SYSTEMS 3 0 0 3

Course Objectives
Understand the concepts of database
Design a good Relational Database using SQL
Create and manipulate database tables using basic and advanced SQL Queries

Course Outcomes (COs)
Can do Programming of Database queries
Able to create users and set Privileges to the users
Can able to tune the database for higher performance

UNIT I 8 Hours
DATABASE DESIGN CONCEPTS
Fundamentals of Database - Features of Good Relational Design - Normalization - 1NF - 2NF - 3NF - BCNF - ER Diagrams - Keys - ACID

UNIT II 8 Hours
BASIC QUERIES
DML (Data Manipulation Language) - Insert - Update - Delete - Merge - Select - DDL (Data Definition Language) - Create - Alter - Drop - Truncate - Comment - Rename - DCL (Data Control Language) - Grant - Revoke - TCL (Transaction Control Language) - Commit - Savepoint - Rollback

UNIT III 10 Hours
ADVANCED QUERIES I
Select - Where - Distinct - Like - Order By - Group By - Having - Joins - Left Outer - Right Outer - Full Outer - Inner Join - Natural Joins - Cartesian Product - Subquery

UNIT IV 10 Hours
ADVANCED QUERIES II
Case - When - In - Any - All - And - Or - Not - Null - Ifnull - Pl/sql - Functions - Stored Procedures - Triggers - Cursors

UNIT V 9 Hours
DATABASE ADMINISTRATION
Database Users - Dba - Roles - Installation - User Creation - Privileges - Data Backup - Mirroring - Data Recovery - Tuning

FOR FURTHER READING
Fourth Normal form - Fifth Normal form - No SQL - New SQL - JDBC - ODBC - Database Types - Serializability - Taxonomy of concurrency control mechanisms - Locking and algorithms - Optimistic concurrency control algorithms

Total: 45 Hours

Reference(s)

**Assessment Pattern**

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 4 8 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>2 2 4 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>4 4 8 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>2 4 6 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>3 4 8 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
</tr>
</tbody>
</table>

**Assessment Questions**

**Remember**
- Define Database.
- What is normalization?
- Explain 1NF, 2NF and 3NF in detail.
- Compare 1NF and 2NF
- List out the symbols in ER diagram.
- Differentiate Drop and Truncate keyword in SQL
- What is the full form of SQL?
- List out the four database users.
- Define an Atomic Transaction
- What is BCNF?

**Understand**
- Why we need Normalization?
- How to design a good relational database?
- Specify the uses of ACID property in RDBMS.
- Triggers are written to be executed in response to any of the events.
- In SQL, which command(s) is(are) used to change a table's storage characteristics?
- Mention the uses of subquery.
- Explain about data recovery process.
- Compare functions and stored procedure.
- SQL injection is an attack in which code is inserted into strings that are later passed to an instance of SQL Server.
- What is need for a Query language?

**Apply**
- Discuss about DML, DDL, DCL commands in SQL with an example.
- Find the name of cities with all entries whose temperature is in the range of 71 and 89
- GRANT SELECT ON Table_1 to role_A WITH GRANT OPTION;
- If you want to grant demo_role the permission to create stored procedure then which of the below query can be used?
- If INSERT permission is granted on all tables at the database scope, and INSERT is denied on a specific table in the database (schema scope)
- Which of the stored procedure is used to test SQL injection attack?
- Explicate the different types of JOINS in SQL with an example.

**Analyse**
- Mention the uses of BCNF.
- Which of the following is true about the execution section of a PL/SQL block? A - It is enclosed between the keywords BEGIN and END.
- B - It is a mandatory section.
C - It consists of the executable PL/SQL statements.
D - All of the above.

3. Consider the following code snippet: how many times the loop will run?

```
DECLARE
    number(2);
BEGIN
    FOR a IN 1..20 LOOP END LOOP;
END;
```

Which is the subset of SQL commands used to manipulate Oracle Database structures, including tables?
Can you sort a column using a column alias?
Mention any four roles of DBA.
How to do Mirroring in SQL.
Compare SQL and No-SQL
How to set Privileges for database users?
If suppose a table has SELECT permission denied on it and then the SELECT permission is granted on that table, the DENY permission is then removed on that table.
Point out the correct statement:
- Parameterized data cannot be manipulated by a skilled and determined attacker
- Procedure that constructs SQL statements should be reviewed for injection vulnerabilities
- The primary form of SQL injection consists of indirect insertion of code
- None of the mentioned

When should use the keyword 'WHEN' in SQL.

Evaluate
Is a NULL value same as zero or a blank space? If not then what is the difference? Is a NULL value same as zero or a blank space? If not then what is the difference?
Any user-controlled parameter that gets processed by the application includes vulnerabilities like:
- ___________ is time based SQL injection attack.

Create
Design a database for an employee including all his details.
Normalize the tables created for an employee database using BCNF.

---

**Course Objectives**

- Understand the abstract data types of stacks and queues
- Understand the variety of ways that linearly and weakly ordered data can be stored, accessed, and manipulated;
- Understand various sorting algorithms and the run-time analysis required to determine their efficiencies

---

**Course Outcomes (COs)**

- Design algorithms for solving problems that use linear and non-linear data structures
- Use appropriate data structure and algorithm to solve a problem
- Solve problems using algorithm design methods
UNIT I  
**LINEAR STRUCTURES**  
Abstract Data Types (ADT) - List ADT - array-based implementation - linked list implementation - cursor-based linked lists - doubly-linked lists - applications of lists - Stack ADT - Queue ADT - circular queue implementation - Applications of stacks and queues

UNIT II  
**TREE STRUCTURES**  
Need for non-linear structures - Tree ADT - tree traversals - Binary Tree ADT - expression trees - applications of trees - binary search tree ADT

UNIT III  
**BALANCED SEARCH TREES AND INDEXING**  
AVL trees - Binary Heaps - B-Tree - Hashing - Separate chaining - open addressing - Linear probing

UNIT IV  
**GRAPHS**  
Definitions - Topological sort - breadth-first traversal - shortest-path algorithms - minimum spanning tree - Prim's and Kruskal's algorithms - Depth-first traversal - applications of graphs

UNIT V  
**ALGORITHM DESIGN AND ANALYSIS**  
Greedy algorithms - Divide and conquer - Dynamic programming - backtracking - branch and bound - Randomized algorithms - algorithm analysis - asymptotic notations - recurrences - NP complete problems

**FOR FURTHER READING**  
Binary heap - heap sort - knapsack problem - travelling salesman problem

**Total: 45 Hours**

**Reference(s)**  

**Assessment Pattern**

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>C</td>
<td>P</td>
<td>M</td>
<td>F</td>
<td>C</td>
<td>P</td>
</tr>
</tbody>
</table>

**Total 100**

**Assessment Questions**

**Remember**
- What is a data structure?
- What is a non-linear data structure?
- What is a linear data structure?
List the areas in which data structures are applied extensively.
Define stack
What is big O notation?
What is an ADT?
Specify the basic operations of stack and queue.
List the applications of stack and queue.
What is tree and list out few of the applications of tree data-structure?

Understand
Why recursive algorithms are efficient than non-recursive algorithms?
What is the minimum number of queues needed to implement the priority queue?
Describe a situation where storing items in an array is clearly better than storing items on a linked list.
Write a class definition that could be used to define a node in a doubly linked list. Include only the instance variables, not the methods. Also write one sentence to describe a situation when a doubly linked list is appropriate.
How many different trees are possible with 10 nodes?
How many different trees are possible with 10 nodes?
What is the condition for balancing an AVL tree?
What is the suitable data structure for constructing a tree?
What are the steps to insert a new item at the head of a linked list?
Classify the Hashing Functions based on the methods by which the key value is found.
Describe the time complexity of sorting and searching algorithms.

Apply
Convert the expression (a+b)*c/d-e into infix, prefix and postfix notations.
Demonstrate Dijkstra’s algorithm to find the shortest distance in a weighted graph.
Sort the given values using Quick Sort : 65 70 75 80 85 60 55 50 45
Construct a tree for the given inorder and postorder traversals. Inorder : GBDAHEICF
Postorder : GDBHIEFCA
Identify the meaning of height balanced tree. How rebalancing is done in height balanced tree? Discuss it with suitable example.
Define an AVL tree. Obtain an AVL tree by inserting one integer at a time in the following sequence: 150, 155, 160, 115, 110, 140, 120, 145, 130, 147, 170, 180. Show all the steps.
Draw a hash table with chaining and a size of 9. Use the hash function “k%9” to insert the keys 5, 29, 20, 0, and 18 into your table.
Given a list of elements 12, 45, 56, 89, 78, 125, 01, 3, 47, 555, 999, 99, 21 trace the steps to sort them using bubble sort algorithm.
Sort the following numbers using radix sort: 523, 244, 7, 80, 930, 920. Show the contents of the queues at the end of the second pass.
The preorder traversal sequence of a binary search tree is 30, 20, 10, 15, 25, 23, 39, 35, 42. Find the postorder traversal sequence of the same tree?

Analyse
Differentiate linear and non linear data structure.
Contrast ADT implementation of array and linked list.
Compare internal and external sorting.
Differentiate between binary tree and binary search tree.
Compare linear and binary search.
Distinguish DFS and BFS.

Evaluate
Evaluate the best case and worst case complexity for searching algorithms.
Can stack be used to perform queue operations? Justify.
Explain the basic operations performed in a Binary heap. Construct a Min and MAX heap for the following values: 23, 67, 1, 45, 7, 89, 56, 35

Summarize the concept of Huffman algorithm for constructing an optimal prefix code. Apply the algorithm and find the code for the following data: (a, 300), (b, 384), (c, 77), (d, 34), (e, 23). Read the input as (character, frequency).

Create

Develop an application using a stack /Queue /List /Tree that reflects a real world problem. Develop an algorithm for Minimax tic-tac-toe algorithm with alpha-beta pruning using backtracking strategy.

Course Objectives

Familiarize with the fundamentals of data science and related concepts
Understand the usage of mathematical models and visualization tools

Course Outcomes (COs)

Understand data science fundamentals and apply them to business and industry
Apply probability and statistics concepts for data analysis
Apply clustering and classification algorithms for data analysis.
Apply mathematical modelling concepts and use visualization tools.

UNIT I
INTRODUCTION
Data Science Fundamentals, Exploring data engineering pipelines, Applying data science and data warehousing to business and industry

UNIT II
PROBABILITY AND STATISTICS
Fundamental concepts of probability, Linear Regressions, simulations, Time series analysis, Association Analysis

UNIT III
CLUSTERING AND CLASSIFICATION
Basics, Identifying clusters, Nearest Neighbor Algorithms, Classification Algorithms

UNIT IV
MATHEMATICAL MODELLING
Multicriteria decision making, Numerical Methods in Data Science, Web and spatial data analytics, Text Mining

UNIT V
VISUALIZATION AND TOOLS
Types of visualizations, using d3.js for data visualization, R Introduction, coding in R, working with Graphics in R

Total: 45 Hours

Reference(s)

Lillian Pierson, Data Science for Dummies, John Wiley, 2015
Andrie de Vries, Joris Meys, R For Dummies, John Wiley and Sons, 2012
Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>10</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Questions

**Remember**

List the different areas that seems to connect with data science field.
Differentiate between data warehousing and databases.
Differentiate between parametric and non parametric models.
List the different types of visualizations that is typically used in the analysis of data.
List of benefits of using d3.js java script library.
State the working principle of apriori frequent itemset mining algorithm.
List the different dimensional modelling techniques applied in data warehousing.
What is the purpose of using olap (online analytical processing) software?
List the mathematical concepts used in latent semantic indexing.
State k-means algorithm for data clustering.

**Understand**

Differentiate between supervised learning and unsupervised learning.
How is data science different from other areas such as mathematics and statistics?
How do the concepts of probability theory applied in the field of data science? Illustrate with examples.
Explain how neural network concepts are applied in data classification problems. Illustrate with examples.
How are eigen vectors applied in page raking algorithm?
Any superset of an infrequent itemset is infrequent. Justify.
Why do we normalize the rows of adjacency matrix by dividing every element of the matrix by its row count in Page Ranking Algorithm?
When does rank sink problem occur in web graphs? Illustrate with an example.
Why sigmoid function is preferred as an activation function in backpropagation neural networks?

**Apply**

State and prove bayes theorem.
Find the least square regression line for the given data points: \{ (-2,-1),(1,1),(3,2) \}
How to perform a logistic regression in R environment?
What are dichotomous outcome variables? How is a logit model used in modelling such variables? Illustrate with examples.
Define a histogram. How do you create a histogram in R programming environment?
Write an R program to write a matrix to a file.
Compute the page rank of following web graph matrix: (1,2), (1,3), (3,2), (3,4), (3,5), (4,5), (5,4). Read the edge data as (vertex1, vertex2).
Compute the similarity of the following documents using LSI algorithm: 1. Apple computer is the best computer. 2. The best fruit if apple. 3. Fruit is good for health.

**Analyse**

1. Analyze the HITS algorithm and LSI algorithm with respect to the mathematical model.
In BPN networks, the accuracy of classification depends on the number of hidden layers. Illustrate.

Evaluate

Why is the damping factor usually set to 0.85 in page ranking algorithm?

Compare the different classification algorithms including neural network algorithms, distance based algorithms and probabilistic algorithms and suggest a suitable method for fraudulent credit card transaction classification.

List the different distance measures used in data clustering and identify a suitable measure for spatial data clustering.

Create

Design an algorithm to analyze the user calling behaviour in a mobile network. You may assume that a matrix is used in representing the data.

Design a new algorithm to compute frequent itemsets that should address all the disadvantages of Apriori algorithm.

Design a suitable schema for constructing a data warehouse for storing ATM transaction records of different banks.

15IT0YD OBJECT ORIENTED PROGRAMMING 3 0 0 3

Course Objectives

Understand the concepts of Object Oriented Programming

Gain thorough knowledge in programming with C++

Know the dynamic activity in Real world application

Course Outcomes (COs)

Understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc

Analyze the characteristics of Object Oriented Programming

Write programs that perform explicit memory management

Implement object oriented features to solve various computing problems using C++ language

UNIT I 9 Hours

INTRODUCTION


UNIT II 9 Hours

OBJECTS AND CLASSES

Structures and Functions - Simple Class and object - Constructors and Destructors- Object as Function Arguments - Returning Objects from Functions - Array of Objects - Inline functions - Function overloading

UNIT III 10 Hours

OPERATOR OVERLOADING AND INHERITANCE

Need of operator overloading - Overloading Unary Operators - Overloading binary Operators-Inheritance: Derived Class and Base Class-Derived Class Constructors- Class Hierarchies - Levels of Inheritance
UNIT IV
POLYMORPHISM AND MEMORY MANAGEMENT
Overriding Member Functions - Virtual Function - Abstract classes and pure virtual function - Friend function - Static Function - Memory Management: new and delete- this Pointer- File streams - Streams - String I/O - Character I/O - File Pointers

UNIT V
TEMPLATES AND EXCEPTION HANDLING
Templates: Introduction - Function Templates - Overloading Function Templates - Class Templates - Exception Handling - Multiple exceptions, exceptions with arguments

FOR FURTHER READING
Type conversion- Default argument function- Assignment and Copy Initialization- Friend Class - I/O with Multiple Objects-Error handling in file I/O

LAB EXPERIMENTS
Program Analysis and Project Planning
Software requirement Analysis
Data Modeling
Software Development and Debugging
Software Testing
Mini projects - Library Management System, Hotel Management System, Timetable Generation

Total: 45 Hours

Reference(s)
Deitel and Deitel, C++ How to program, Prentice Hall, New Delhi, 2005
D. S. Malik, C++ Programming. Thomson, New Delhi, 2007

Assessment Pattern

<table>
<thead>
<tr>
<th>Unit/RBT</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td>F C P M</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4 2 4 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>4 4 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>4 4 2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>2 2 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>2 4 6 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 100</td>
</tr>
</tbody>
</table>

Assessment Questions
Remember
Recall 5 characteristics of procedure-oriented language.
List out the features of Object Oriented Programming.
Name any four applications of OOPS.
Explain the use of this pointer?
Define pure virtual functions.
List the advantage of default argument in a constructor.
Show the class structure of real time environment objects.
Outline the functions of Cout and Cin for command line interpretations.
Write the specification of an exception. When is it used?
Explain, with an example, how you would create space for an array of objects using pointers.

Understand
Compare structural and object oriented programming.
Explain how will you overload Unary and Binary operator using member functions and friend functions?
Classify how the endl and setw manipulator works with an example program.
Categorize the features of Procedure Oriented Language and Object Oriented Language.
Illustrate the concepts of OOPS with its necessary example for each.
Sketch the conversion between objects and basic types in data conversion.
Why are destructors used? Write the syntax of destructor.
How the concept of overriding is achieved in C++?
How is an exception handled while it facing a divided by zero error in C++?
When do we use multiple catch handlers?

Apply
Construct a program to perform complex number arithmetic operations using operator overloading.
Execute a program in C++ to count the number of words in a line of text.
Can you transfer values from derived class constructor to base class constructor?
Implement a program to create arrays dynamically at run time?
What will happen to an object if a destructor is not coded in the program?
Make use of all the data types available in C++ programming language in a single program and perform the arithmetic operations on them.
Explain with a program about the concept of binary operator overloading for the insertion operator
How to achieve operator overloading using friend function?
Write a statement that will create an object called fob for writing, and associate it with a file name DATA.
A class(or function) template is known as a parameterized class(or function). Comment.

Analyse
Attribute the problems of programming with switch logic. Explain why polymorphism is an effective alternative for using switch logic.
Pick out the discrimination's between structured programming language and procedure-oriented language.
Locate the features of unconditional branching statements used in C++ with their types.
Infer the data members and member functions of a bank account.
Data items in a class must always be private. Justify
How will you use a single function inside one or more classes?

Evaluate
Write a simple program to display the multiplication table of 5 upto 10 times using for loop.
Engrave in detail about the recursive functions available in C++ programming and implement the Fibonacci series using recursive functions
Define a Divide by Zero definition and use it to throw exceptions on attempts to divide by zero.
Identify the error in the following program. #include
Template T1%26MinMax(T1 t1, T2 t2)
{
return t1>t2 ? t1 : t2; cout<< ? ?;
Create

Create a class MAT of size m x n. Define all possible matrix operations for MAT type objects.
Generate a class with the overload *= operator such that the operator should also permit the results of the operation to be used in other calculations, as in s3 = s1 *= s2;
Construct a program for income tax calculation where the employees are trainee, team lead, manager, senior manager. Illustrate Friend Function for this problem by considering their salary.

ONE CREDIT COURSES

1SIT0XA ANDROID APPLICATION DEVELOPMENT

Course Objectives

Design a GUI for Android applications
Develop Android Apps for Real World Applications

Course Outcomes (COs)

Develop a working knowledge of the custom UI elements and positioning
Build and deploy his/ her Android application

UNIT I

INTRODUCTION

Android architecture- Pillars (Activity, Intent, Services and Broadcast receivers)- Setting up android Development- Hello Android (Understanding Hello World Program)- MVC Pattern- Creating screens, layouts and Navigation - Styles and Themes - Fragments

UNIT II

HANDS ON SESSION

Working with Android UI elements - multiple resolution- Camera - Multimedia files - Sqlite Database Files - using GPS to get user location - Google Maps - Webview - Introduction to JSON - Invoking REST API.

UNIT III

APPLICATION DEVELOPMENT

Multi flavor app with gradle - Publishing App to Google Play

Total: 18 Hours

Reference(s)

https://developer.android.com/design/index.html
15IT0XB PYTHON ESSENTIALS 1 0 0 1

Course Objectives
Create and execute Python programs
Install and run the Python interpreter

Course Outcomes (COs)
Solve problems requiring the writing of well-documented programs in the Python language
Build and deploy his/ her own application

UNIT I 6 Hours
INTRODUCTION
Introduction - Comments - IO operations - Data types - Operators - Variables - Control Structures - String Handling

UNIT II 6 Hours
COLLECTIONS AND FILE HANDLING
Functions - Recursion - Lists - Tuples - Sets - Dictionaries - File Handling Operations Opening and closing files - Reading and writing files - Renaming and deleting files - Directories in Python

UNIT III 6 Hours
EXCEPTION HANDLING AND OOPS
Handling Runtime Errors - Exception Handling
Exceptions - Handling exceptions - Raising exceptions - user-defined exceptions
Object Oriented Programming in Python - Classes and Objects - Methods - Principles of Object Orientation - Inheritance - Polymorphism - Encapsulation

Total: 18 Hours

Reference(s)
Paul Barry, Head First Python, 2nd edition, O'Reilly Media, 2015
https://docs.python.org/3/tutorial/
http://www.diveintopython.net/toc/index.html
http://www.learnpython.org/

ADDITIONAL ONE CREDIT COURSES (I to III Semesters)

15GE0XA HEALTH AND FITNESS

Course Objectives
To understand the fundamental concepts about physical fitness & its types, training and assessment of physical fitness.
Course Outcomes (COs)

Acquire the knowledge and training of the individual physical, mental and social concepts.

Understand the fundamental concepts of yogic practice and physical fitness.

To acquire the knowledge about nutrition and health consciousness.

FITNESS: Meaning & Definition – Need & importance of Physical fitness – Types Physical fitness -

Exercise, Training and Conditioning and it is important.

YOGA: Meaning and definition – Principles of practicing – Basic Asana and it important – Pranayama and Meditation - Relaxation Techniques.


Total: 15 Hours

References


15GE0XB FOUNDATION COURSE IN COMMUNITY RADIO TECHNOLOGY

Course Objective

The course focuses on community radio technology and various program productions techniques for radio broadcasting.

Course Outcomes (COs)

Understand the hardware required for field recording and setting up a studio and carry out studio and field recording

Examine the available options for telephony interfaces for radio

Demonstrate proper techniques of wiring, fixing of connectors, soldering and use of tools and equipment for studio work.
INTRODUCTION TO COMMUNITY RADIO

Evolution of Community Radio (CR) in India- principles behind setting up of CR- policy guidelines and their impact on technology and content of a CR station- fundamental principles behind deciding the technology for a CR station.

STUDIO TECHNOLOGY

Properties and components of sound-difference between analogue and digital audio-hardware required for field recording and setting up a studio-fundamental principles for setting up an audio studio

AUDIO PRODUCTION

Concept of recording and storing audio-hardware related to audio recording-open source software solutions for audio production- telephony interfaces for radio- audio Post Production

STUDIO OPERATIONS

Wiring, fixing of connectors, soldering and use of tools and equipment- preventive and corrective maintenance of studio and equipment.

RADIO TRANSMISSION TECHNOLOGY

Components of the FM transmission chain- FM transmitter-different types of FM antenna - coaxial cable- propagation and coverage of RF signals-FM transmitter setup

Total: 15 Hours

Reference(s)


www.floridasound.com

www.mediacollege.com

www.procosound.com

15GE0XC VEDIC MATHEMATICS

Course Objectives

To improve their calculation speed, analytical thinking and numerical skills.
Course outcome (CO)

Solve problems creatively in mathematics and its applications.

VEDIC MATHEMATICS
Addition- Subtraction- System of Multiplication- Squaring numbers- Cube roots- Square roots-
Solution of simultaneous equations- Solutions of Quadratic equations-

Total: 15 Hours

References

15GE0XD INTRODUCTION TO ALGORITHM

Course Objectives
Analyze the asymptotic performance of algorithms, Divide and conquer and Dynamic Problems.
Use Sorting and Searching algorithms for arranging the data.
Apply important algorithmic techniques to solve the real world Problems.

Course Outcomes (COs)
Apply Divide and conquer and Dynamic Programming Algorithm techniques to Provide the solutions for simple Problems.
Design algorithms for Performing Sorting and Searching of data.
Construct the Graph, Heap and BST for the given Data information.


Total: 15 Hours

References

### 15GE0XE ETYMOLOGY

#### Course Objectives

To increase vocabulary and enhance use, knowledge, and understanding of the English language;

To stimulate an appreciation for the English language, including how it developed, how new words enter the language, and how it continues to be dynamic;

To demonstrate the importance of a broad-based vocabulary for effective oral and written communication; and

#### Course Outcomes (COs)

Examine prefixes, roots, and suffixes of Latin, Greek, Germanic, and Anglo-Saxon origin.

Explore the historical aspects of language, including the infusion of Indo-European languages, semantic changes, and the influence of world events.

### CONVENTIONS & VOCABULARY

- Acronyms
- Abbreviations
- Initialisms
- Jargon
- Neologisms
- Idiomatic Expressions
- Euphemisms
- Spoonerisms
- Malapropisms
- Mondegreens
- Words Derived from Latin
- Words Derived from Greek
- Words Derived from Germanic/Anglo-Saxon
- Abstract word Acronym
- Affix Analogy
- Antonym
- Apheresis
- Blend word Assimilation
- Colloquial language
- Clipped word

### WORD ANALYSIS

- Concrete word
- Derivative
- Dialect
- Diminutive suffix
- Dissimilation
- Doublet
- Etymology
- Euphemism
- Figurative word
- Homonym
- Hybrid word
- Inflection
- Informal language
- Infusion
- Jargon
- Linguistics
- Loan words
- Metathesis
- Modify
- Philology
- Onomatopoeia
- Romance language
- Prefix
- Semantics
- Root-base word
- Suffix
- Slang
- Word component

#### Total : 15 Hours

#### Reference(s)

- Nurnberg W, Maxwell and Rosenblum, Morris, How to build a better Vocabulary, Completely Revised and Updated, Popular Library. 1961
15GE0XF HINDUSTANI MUSIC

Course Objectives
To have an awareness on aesthetic and therapeutic aspects of Hindustani music
To identify and differentiate the various styles and nuances of Hindustani music
To apply the knowledge accumulated throughout the duration of the course by way of improvisation, composition and presentation

Course Outcome (CO)
1. Have Basic knowledge of aesthetic and therapeutic value of Hindustani Music

AESTHETICS
Introduction to music - Aesthetics of Hindustani Music - Classification (Raga, instruments, style as per the presentation and the gharanaas) - Folk music, Dhamaar, Dhrupad

COMPOSITION AND THERAPEUTIC VALUE
Taal and Raga - Bandeesh, Taraanaa – Madhya and drut laya, Vilambit khyaal as demonstration - Therapeutic benefits of Hindustani music - Stage performance

Total: 20 Hours

Reference(s):
Vasant, Sangeet Vishaarad, Hathras, Uttar Pradesh, 2015.

Websites:
raag-hindustani.com/
play.raaga.com/Hindustani
raag-hindustani.com/Scales3.html
www.poshmaal.com/ragas.html
www.soundofindia.com/raagas.asp
www.likhati.com/2010/10/20/popular-ragas-for-the-beginner-ear-
15GE0XG CONCEPT, METHODOLOGY AND APPLICATIONS OF VERMICOMPOSTING

Course Objectives

To understand the importance of safe methods of treating solid wastes generated through various human activities

To appreciate the skills / devices / practices associated with the compact procedures of biodegradation of unwanted solid residues

Course Outcomes (COs)

Understand the role of recycling of garbage leading to the sustenance of our health and environment.

Recognize the organic farming practices and production of healthy food products.

Prepare and maintain tips for small scale compost units and thereby becoming more environmentally conscious.

VERMICOMPOSTING TECHNOLOGY


Total: 15 Hours

Reference(s)


www.organicgrowingwithworms.com.au

New York Times – Scientists Hope to Cultivate and Immune System for Crops
15GE0XH AGRICULTURE FOR ENGINEERS

Course Objectives

To impart the basic knowledge of agricultural and horticultural crops, cropping systems
To study the weed and nutrient management, irrigation water requirement and its quality

Course Outcomes (COs)

Understand the science of Agriculture
Summarize and apply the methodologies needed in agriculture based on the field conditions.
Develop enough confidence to identify the crop patterns in real world and offer appropriate solutions.

AGRONOMICAL PRACTICES AND CROPS 5 Hours
Definition and scope of agronomy, Classification of Crops, agricultural and horticultural crops

CROP ROTATION, CROPPING SYSTEMS, RELAY AND MIXED CROPPING 5 Hours

PLANT NUTRIENTS 5 Hours
Essential Plant Nutrients, Nutrient Deficiency, Toxicity and Control Measures. Chemical fertilizers, fertilizer Reaction in Soil and Use Efficiency

QUALITY OF IRRIGATION WATER AND IRRIGATION METHODS 5 Hours
Quality of Irrigation Water, Poor Quality of Irrigation Water and Management Practices. Surface Irrigation methods, and micro irrigation methods

Total: 20 Hours

References


**15GE0XI**  
INTRODUCTION TO DATA ANALYSIS USING SOFTWARE

---

**Course Objectives**

- To familiarize students on the features of MS Excel.
- To enable the students to use Excel in the area of critical evaluation.
- Facilitate the student to construct graphs.

**Course Outcomes (COs)**

2. Apply built in functions for data analysis.
3. Prepare dynamic Charts.

**EXCEL FUNDAMENTALS AND EDITING**  
4 Hours


**FORMATTING**  
4 Hours


**POWER ORGANIZING AND CUSTOMIZING EXCEL**  
4 Hours


Adjusting Views – Setting Printing Options – Using Multiple Panes – Customizing Excel Using the Options Dialog Box.
CRUNCHING NUMBERS  
5 Hours
Building a Formula – Using Basic Built-in Functions – Using Functions to Analyze Data – Using Names in Functions – Array Functions

WORK SHEET CHARTS  
3 Hours
Planning a Chart – Creating Chart – Formatting a Chart – Adding Labels and Arrows.

Total: 20 Hours

References

15GE0XJ ANALYSIS USING PIVOT TABLE

Course Objectives
To familiarize students on the features of Pivot Table.
To enable the students to use Pivot Table in the area of data analysis.
Facilitate the student to construct the charts for visualization of data.

Course Outcomes (COs)
Able to construct the Pivot Table and Group, Sort, Filter the Data to do the analysis.
Able to do the Calculation with in Pivot Table for advance analysis.
Capable of Constructing Pivot Charts to make visual presentation.

PIVOT TABLE FUNDAMENTALS  
4 Hours
Introduction about Pivot Table, Why and When to use the Pivot Table, Anatomy of the Pivot Table, Limitations, Preparing the Source Data, Creating the Pivot Table.

GROUPING PIVOT TABLE DATA  
4 Hours
Grouping the Items in a Report Filter, Grouping Text Items, Grouping Dates by Month, Grouping Dates Using the Starting Date, Grouping Dates by Fiscal Quarter, Grouping Dates by Week, Grouping Dates by Months and Weeks, Grouping Dates in One Pivot Table Affects Another Pivot Table, Grouping Dates Outside the Range.
SORTING AND FILTERING PIVOT TABLE DATA

4 Hours

Sorting a Pivot Field: Sorting Value Items, Sorting Text Items, Sorting Items in a Custom Order.
Filtering a Pivot Field: Manual Filter, Label Filter, Value Filter, Multiple Filters.

CALCULATIONS WITHIN THE PIVOT TABLES

5 Hours

Using Formulae: Creating a Calculated Field with and without “IF Condition, Calculated Item, Using
Custom Calculations: % of Column, % of Row, % of Total, % Of, Running Total, Difference From, %
Difference From, Index.

PIVOT CHARTS

3 Hours

Creating a Normal Chart from Pivot Table Data, Filtering the Pivot Chart, Changing the Series Order,
Changing Pivot Chart Layout Affects Pivot Table, Changing Number Format in Pivot Table Affects
Pivot Chart, Converting a Pivot Chart to a Static Chart, Refreshing the Pivot Chart, Creating Multiple
Series for Years

Total: 20 Hours

Reference(s)

BRIDGE COURSES

15ITB01 PROGRAMMING WITH C & C++

Introduction to C Programming

Object Oriented Programming Concepts
Need for object oriented programming – Characteristics of object oriented programming – Classes and Objects: Simple class - Data Members and Member Functions – Function Overloading - Constructors and Destructors - Operator overloading: Unary Operators - Binary Operators - Pitfalls of Operator Overloading. Inheritance: Derived Class and Base Class - Derived Class Constructors - Overriding Member Functions - Public and Private Inheritance - Types of Inheritance: Single, Multi Level, Multiple, Hierarchical and Hybrid.

Total : 30 Hours

15ITB02 ENGINEERING GRAPHICS

Conventions and basic drawings
Importance - conventions - ISO and BIS - drawing tools and drawing sheets - lettering, numbering, dimensioning, lines and symbols - Conic sections - types constructions - ellipse, parabola and hyperbola - eccentricity and parallelogram method.

Projections
Principles-first and third angle projections - Points - first angle projection of points Straight lines - parallel, perpendicular and inclined to one reference plane - Solid - cylinders, pyramids, prisms and cones - perspective projections - Orthographic Projections - concepts - front view, top view and side view of simple solids - Section of Solids - simple illustrations

Total : 30 Hours