ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2018-19 onwards

Department of Information Technology (IT)

For
B.Tech. Four Year Degree Programme
(MR18 Regulations)

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

(An UGC Autonomous Institution, Approved by AICTE and Affiliated to JNTUH Hyderabad) Recognized under section 2(f) &12 (B) of UGC Act 1956, Accredited by NAAC with ‘A’ Grade (II Cycle)Maisammaguda,Dhulapally (Post Via Kompally), Secunderabad-500 100
Website: www.mrec.ac.in E-mail: principal@mrec.ac.in
MALLA REDDY ENGINEERING COLLEGE  
(AUTONOMOUS)  
MR18 – ACADEMIC REGULATIONS (CBCS)  
for B.Tech. (REGULAR) DEGREE PROGRAMME  

Applicable for the students of B.Tech. (Regular) programme admitted from the Academic Year 2018-19 onwards  

The B.Tech. Degree of Jawaharlal Nehru Technological University Hyderabad, Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.  

VISION  
To establish a reputable professional education centre, to impart high quality trend setting technologies in an ambience of humanity, wisdom, intellect and innovation to nurture the students to become competent and committed professionals with disciplined ethical values.  

MISSION  
Commitment to progress in mining new knowledge by adopting cutting-edge technologies to promote academic growth by offering state-of-the-art undergraduate and postgraduate programmes based on well-versed perceptions of global areas of specialization to serve the nation with advanced technical knowledge.  

DEPARTMENT VISION  
Crop qualified IT professionals, entrepreneurs, innovators and researchers with essential skills and aptitude to function in the IT domain and with wisdom and versatility that will last forever despite an ever changing environment.  

DEPARTMENT MISSION  
Trigger off the young minds to carry out research for the benefit of society and to bestow sound knowledge in state of art technologies for students to transform into professionals.
PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To outshine in professional career with sound problem solving ability for providing IT solutions by proper plan, analysis, design, implementation and validation.

PEO 2: To pursue training, advance study and research using scientific, technical and communication base to cope with the evolution in the technology.

PEO 3: To utilize the acquired technical skills and knowledge for the benefit of society

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1: Identify the mathematical abstractions and algorithm design techniques together with emerging Software Tools to solve complexities indulged in efficient programming.

PSO 2: Apply the core concepts of current technologies in the hardware, software domains in accomplishing IT enabled services to meet out societal needs.

PSO 3: Practice modern computing techniques by continual learning process with ethical concerns in establishing innovative career path.
## PROGRAMME OUTCOMES (POs)

<table>
<thead>
<tr>
<th>PO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO 1</td>
<td><strong>Engineering knowledge</strong>: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.</td>
</tr>
<tr>
<td>PO 2</td>
<td><strong>Problem analysis</strong>: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.</td>
</tr>
<tr>
<td>PO 3</td>
<td><strong>Design/development of solutions</strong>: 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.</td>
</tr>
<tr>
<td>PO 4</td>
<td><strong>Conduct investigations of complex problems</strong>: 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.</td>
</tr>
<tr>
<td>PO 5</td>
<td><strong>Modern tool usage</strong>: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.</td>
</tr>
<tr>
<td>PO 6</td>
<td><strong>The engineer and society</strong>: 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.</td>
</tr>
<tr>
<td>PO 7</td>
<td><strong>Environment and sustainability</strong>: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.</td>
</tr>
<tr>
<td>PO 8</td>
<td><strong>Ethics</strong>: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.</td>
</tr>
<tr>
<td>PO 9</td>
<td><strong>Individual and team work</strong>: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.</td>
</tr>
<tr>
<td>PO 10</td>
<td><strong>Communication</strong>: 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.</td>
</tr>
<tr>
<td>PO 11</td>
<td><strong>Project management and finance</strong>: 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.</td>
</tr>
<tr>
<td>PO 12</td>
<td><strong>Life-long learning</strong>: 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.</td>
</tr>
</tbody>
</table>
1. Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T): Malla Reddy Engineering College (Autonomous) (MREC-A) offers Four Year (Eight Semesters) Bachelor of Technology (B.Tech.) Under Graduate Programmes, under Choice Based Credit System (CBCS) in the following Branches of Engineering.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Branch Code</th>
<th>Branch</th>
<th>Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>01</td>
<td>Civil Engineering (CE)</td>
<td>180</td>
</tr>
<tr>
<td>2</td>
<td>02</td>
<td>Electrical and Electronics Engineering (EEE)</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>03</td>
<td>Mechanical Engineering (ME)</td>
<td>240</td>
</tr>
<tr>
<td>4</td>
<td>04</td>
<td>Electronics and Communication Engineering (ECE)</td>
<td>180</td>
</tr>
<tr>
<td>5</td>
<td>05</td>
<td>Computer Science and Engineering (CSE)</td>
<td>240</td>
</tr>
<tr>
<td>6</td>
<td>06</td>
<td>Information Technology (IT)</td>
<td>60</td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td>Mining Engineering (Mi.E)</td>
<td>60</td>
</tr>
</tbody>
</table>

2. Eligibility for Admission
2.1 Admission to the UGP shall be made either on the basis of the merit rank obtained by the qualifying candidate in entrance test conducted by the Telangana State Government (TSEAMCET), or the University, or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government of Telangana from time to time.
2.2 The medium of instructions for the entire UGP in E&T will be ENGLISH only.

3. B.Tech. Programme (UGP) Structure & Duration of Study
3.1 A student after securing admission shall pursue the Under Graduate Programme in B.Tech. in a minimum period of four academic years (8 semesters) and a maximum period of eight academic years (16 semesters) starting from the date of commencement of first year first semester. Further 2 years of extension is allowed for appearing examinations, failing which student shall forfeit seat in B.Tech. Course. Each semester is structured to provide around 20 credits, totaling to 160 credits for the entire B.Tech. programme. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the Under Graduate Programme and award of the B.Tech. degree.
3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.2.1 Semester Scheme:
Each Under graduate programme is of 4 academic years (8 Semesters), with the academic year being divided into two semesters of 22 weeks (≥90 instructional days, each, each semester having ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’). Under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and Curriculum/ Course Structure as suggested by AICTE are followed.

3.2.2 Credit Courses:
All Subjects/ Courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each Subject/ Course in a L: T: P: C (Lecture Periods:
Tutorial Periods: Practical Periods: Credits) Structure, based on the following general pattern.

- One Credit - for one hour/ Week/ Semester for Theory/ Lecture (L) Courses/ Tutorials (T).
- One Credit - for two hours/ Week/ Semester for Laboratory/ Practical (P) Courses.

Courses like Environmental Sciences, Induction Programme, Gender Sensitization, Indian Constitution, Essence of Indian Traditional Knowledge and other student activities like Internship, Sports/Yoga and NSS are identified as Mandatory/Audit courses. These courses will not carry any credits.

3.2.3 Subject/ Course Classification:
All subjects/ courses offered for the under graduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The Institute has followed almost all the guidelines issued by AICTE/UGC/Affiliating University.

(a) **Foundation Courses (FC)**
(b) **Core Courses (CC)**
(c) **Elective Courses (EC)**
(d) **Mandatory Courses (MC)**
(e) **Audit Courses (AC)**

- **Foundation Courses (FC)** are further categorized as:
  (i) Humanities and Social Sciences including Management courses (HSMC)
  (ii) Basic Science Courses (BSC)
  (iii) Engineering Science Courses (ESC).

- **Core Courses (CC) and Elective Courses (EC)** are categorized as Professional Subjects (PS), which are further subdivided as –
  (i) Professional Core Courses (PCC)
  (ii) Professional Elective Courses (PEC)
  (iii) Open Elective Courses (OEC)
  (iv) Project (PROJ)

- **Mandatory Courses (MC)** - Non-credit with evaluation).
- **Audit Courses (AC)** – Non- credit without evaluation).

3.2.4 Course Nomenclature:
The curriculum nomenclature or course structure grouping for each of the UGP in E&T (B.Tech. Degree Programmes), is as listed below (along with AICTE specified range of total credits).

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Classification</th>
<th>Course Work – Subject Area</th>
<th>Distribution of credits</th>
<th>AICTE Suggested Breakup of Credits (Total 160)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HSMC</td>
<td>Humanities and Social sciences including Management courses.</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>BSC Foundation Courses</td>
<td>Basic Sciences (BSC) including Mathematics, Physics, Chemistry and Biology.</td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering Science Courses (ESC) including Engineering Workshop, Engineering Graphics, Basics of Electrical and Electronics / Mechanical / Computer Engineering.</td>
<td>47</td>
<td>24</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4</td>
<td>PCC</td>
<td>Core Courses</td>
<td>Professional core Courses are relevant to the chosen specialization/branch; [May be split into Hard (no choice) and Soft (with choice)], if required.</td>
<td>39</td>
</tr>
<tr>
<td>5</td>
<td>PEC</td>
<td>Professional Electives</td>
<td>Professional electives are relevant to the chosen specialization/branch.</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>OEC</td>
<td>Open Electives</td>
<td>Open electives are the courses from other technical and/or emerging subject areas.</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>PROJ</td>
<td>Project</td>
<td>Mini Project, Project and Seminar</td>
<td>15</td>
</tr>
<tr>
<td>8</td>
<td>MC</td>
<td>Mandatory Courses</td>
<td>These courses are non-credit courses with evaluation.</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>AC</td>
<td>Audit Courses</td>
<td>These courses are non-credit courses without evaluation.</td>
<td>-</td>
</tr>
</tbody>
</table>

|   |   | Total credits for UGP (B.Tech.) | 160 |

### 4.0 Course Registration

4.1 A ‘Faculty Advisor or Counselor’ shall be assigned to each student, who will advise him on the Under Graduate Programme (UGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

4.2 Academic section of the College invites ‘Registration Forms’ from students within 15 days from the commencement of class work for the first semester through ‘ON-LINE SUBMISSIONS’, ensuring ‘DATE and TIME Stamping’. The ON-LINE registration requests for any ‘SUBSEQUENT SEMESTER’ shall be completed BEFORE the commencement of SEE (Semester End Examinations) of the ‘CURRENT SEMESTER’.

4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the ‘WRITTEN APPROVAL’ from the Faculty Advisor/Counselor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor/Counselor and the Student).

4.4 A Student may be permitted to register for the Subjects/ Course of CHOICE with a typical deviation of ±3 credits of the semester, based on his PROGRESS and SGPA/CGPA and completion of the ‘PRE-REQUISITES’ as indicated for various Subjects/ Courses in the department course structure and syllabus contents. It needs specific approval and signature of the Faculty Advisor/Counselor and Head of the Department, ‘within a period of 15 days’ from the beginning of the current semester.

4.5 If the student submits ambiguous choices or multiple options or erroneous entries during ON-LINE registration for the Subject(s) / Course(s) under a given specified
Course/ Group/ Category as listed in the course structure, only the first mentioned Subject/ Course in that category will be taken into consideration.

4.6 Subject/ Course options exercised through ON-LINE registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for registration (by the Head of Department) in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that semester. Such changes are to be intimated to Chief Controller of Examinations/Principal immediately.

4.7 Open Electives: A student has to complete 3 Open Electives during the period of UGP. The students have to choose open electives from III year I semester onwards from the given list. However, the student cannot opt for an open elective subject offered by their own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

4.8 Professional Electives: A student has to complete 6 Professional Electives during the period of UGP. Students have to choose professional electives from III year I semester onwards from the list of professional electives offered by their departments.

4.9 For Audit Courses like Sports/Yoga and NSS, MOOC/NPTEL online courses etc, a ‘Satisfactory Participation Certificate’ from the authorities concerned for the relevant semester is essential. No Marks or Credits shall be awarded for these activities.

4.10 For Mandatory Courses, a ‘Satisfactory / Not Satisfactory’ grade is awarded based on the performance in both CIE and SEE.

5.0 Subjects/ Courses to be offered
5.1 A typical Section (or Class) strength for each semester shall be 60.
5.2 A Subject/ Course may be offered to the students, ONLY IF a minimum of 40 students opt for the same. The maximum strength of a section is limited to 72.
5.3 More than ONE TEACHER may offer the SAME SUBJECT (Lab / Practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection choice for students will be based on ‘FIRST COME FIRST SERVE’ basis and ‘CGPA Criterion’ (i.e., the first focus shall be on early ON-LINE ENTRY from the student for registration in that semester and the second focus, if needed, will be on CGPA of the student).
5.4 If more entries for registration of a subject come into picture, then the concerned Head of the Department shall take necessary actions, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT.

6.0 Attendance Requirements:
6.1 A student shall be eligible to appear for the Semester End Examinations, if he / she acquire a minimum of 75% of attendance in aggregate of all the Subjects/ Courses (including Non-Credit Courses) for that semester.
6.2 Condoning of shortage of attendance in aggregate up to 10% (>= 65% and < 75%) in each semester may be granted by the College Academic Committee (CAC) on genuine and valid grounds based on the student’s representation with supporting evidence.

6.3 A stipulated fee prescribed by the CAC, shall be payable towards condoning of shortage of attendance.

6.4 Shortage of attendance below 65% in aggregate shall in NO case be condoned.

6.5 Students, whose shortage of attendance is not condoned in any semester, are not eligible to register their Semester End Examinations, they get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may seek re-registration for all those Subjects registered in that Semester in which he got detained, by seeking re-admission for that semester as and when offered; in case if there are any Professional Electives and/ or Open Electives, the same may also be re-registered if offered, however, if those electives are not offered in later semesters, then alternate electives may be chosen from the same set of elective subjects offered under that category.

6.6 If any student fulfills the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0 Academic Requirements:

The following Academic Requirements have to be satisfied, in addition to the attendance requirements mentioned in item No.6.

7.1 A student shall be deemed to have satisfied the Academic Requirements and earned the credits allotted to each Subject/ Course, if he / she secures not less than 35% marks in the Semester End Examination and with a minimum of 40% of the total marks allocated for the course; in terms of Letter Grades, this implies securing ‘P’ Grade or above in that Subject/ Course. If the student secured ‘F’ grade in any subject he/she can apply for recounting / revaluation by paying prescribed fee. If the student is not satisfied after the results declaration of recounting / revaluation he/she can apply for challenge valuation with the prescribed fee. College appoints a faculty member; student can bring another faculty member who taught the respective subject at least once (proof should be provided). The faculty member should be from any autonomous college affiliated to JNTUH or JNTUH constituent colleges.

7.2 A student shall be deemed to have satisfied the Academic Requirements and earned the credits allotted to Mini Project/Technical Seminar/ Project, if he / she secure not less than 40% of the total marks to be awarded for each. The student would be treated as failed, if he (i) does not submit a report on his / her Mini Project / Technical Seminar / Project or does not make a presentation of the same before the Evaluation Committee as per schedule or (ii) secures less than 40% of marks in industry oriented Mini Project/ Technical Seminar/ Project evaluations. He / She may reappear once for each of the above evaluations, when they are scheduled again; if he / she fails in such ‘one-reappearance’ evaluation also, he / she has to reappear for the same in the next subsequent semester, as and when it is scheduled.
### 7.3 Promotion Rules:
Every student has to fulfil the Attendance and Academic requirements by securing the required credits against registered credits as shown below:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Promotion</th>
<th>Conditions to be fulfilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>First year first semester (I Semester) to first year second semester (II Semester)</td>
<td>• Regular course of study of first year first semester. (I Semester)</td>
</tr>
</tbody>
</table>
| 2.    | First year second semester (II Semester) to second year first semester (III Semester) | • Regular course of study of first year second semester (II Semester).  
• Must have secured at least 50% credits up to first year second semester (II Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3.    | Second year first semester (III Semester) to second year second semester (IV Semester) | • Regular course of study of second year first semester (III Semester)                    |
| 4.    | Second year second semester (IV Semester) to third year first semester (V Semester) | • Regular course of study of second year second semester (IV Semester).  
• Must have secured at least 60% credits up to second year second semester (IV Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5.    | Third year first semester (V Semester) to third year second semester (VI Semester) | • Regular course of study of third year first semester (V Semester).                     |
| 6.    | Third year second semester (VI Semester) to fourth year first semester (VII Semester) | • Regular course of study of third year second semester (VI Semester).  
• Must have secured at least 60% credits up to third year second semester (VI Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
7. Fourth year first semester (VII Semester) to fourth year second semester (VIII Semester)
   - Regular course of study of fourth year first semester (VII Semester).

7.4 A Student shall register for all subjects covering 160 credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, fulfils all the Attendance and Academic requirements for 160 credits securing a minimum of ‘P’ Grade (Pass Grade) or above in each subject and earn 160 credits securing SGPA $\geq 5.0$ (in each semester) and CGPA (at the end of each successive semester) $\geq 5.0$, to successfully complete the UGP.

7.5 After securing the necessary 160 credits as specified for the successful completion of the entire under graduate programme, the student can avail exemption of two subjects up to 6 credits, that is, one open elective and one professional elective subject or two professional elective/open electives subjects for optional drop out from these 160 credits earned; resulting in 154 credits for under graduate programme performance evaluation, i.e., the performance of the student in these 154 credits shall alone be taken into account for the calculation of the final CGPA (at the end of under graduate programme, which takes the SGPA of the IV year II semester into account) and shall be indicated in the grade card of IV year II semester. However, the performance of student in the earlier individual semesters, with the corresponding SGPA and CGPA for which grade cards have already been given will not be altered.

7.6 If a student registers for some more ‘Extra Subjects’ (in the parent Department or other Departments/ Branches of Engineering) other than those listed subjects totaling to 160 credits as specified in the Course Structure of his / her department, the performances in those ‘extra Subjects’ (although evaluated and graded using the same procedure as that of the required 160 credits) will not be taken into account while calculating the SGPA and CGPA. For such extra subjects registered, Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in items No.6 and 7.1 to 7.5.

7.7 When a student is detained due to shortage of attendance in any semester, he / she may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements. The academic regulations under which student has been readmitted shall be applicable. However, no Grade Allotments or SGPA/ CGPA calculations will be done for that entire semester in which he / she got detained.

7.8 When a student is detained due to lack of credits in any year, shall be promoted to the next academic year only after acquiring the required academic credits. The academic regulations under which student has been readmitted shall be applicable to him.

7.9 A student eligible to appear in the Semester End Examination in any Subject/ Course, but absent from it or failed (thereby failing to secure ‘P’ Grade or above) may reappear for that Subject/ Course at the supplementary examination as and when conducted. In such cases, his / her Internal Marks (CIE) assessed earlier for that Subject/ Course will be carried over and added to the marks to be obtained in the SEE supplementary examination, for evaluating his / her performance in that subject.
8.0 Evaluation, Distribution and Weightage of Marks

8.1.1 The performance of a student in each semester shall be evaluated subject-wise (irrespective of credits assigned) for 100 marks for Theory, Practicals, Seminar, Drawing / Design, Minor Project, Major Project and Minor Courses etc.,. The Theory / Practical courses are evaluated with two components. 1. Continuous Internal Evaluation (CIE), 2. Semester End Examination (SEE). The distribution of 30 Marks for CIE and 70 Marks for SEE decided in the Academic Council.

8.2 Theory Courses:

8.2.1 Continuous Internal Evaluation (CIE):
CIE shall be carried out for all courses of UG Programmes twice in a semester (2 Midterm examinations) with the help of objective evaluation, subjective evaluation, regular assignments and Attendance. Each mid term examination shall consist of objective test with a duration of 20 minutes, subjective paper shall be conducted with a duration of 90 minutes and one assignment. The composition of objective test, subjective test, assignment and attendance shall be evaluated for 40%, 40%, 10% and 10% of the allocated internal marks.

<table>
<thead>
<tr>
<th>Part</th>
<th>Type of Questions</th>
<th>No. of Questions</th>
<th>Marks per Question</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part - A</td>
<td>Multiple – Choice Questions</td>
<td>20</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Part - B</td>
<td>Choice questions (4 out of 6)</td>
<td>4</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Mid Term Exam Total</td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Assignment</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Attendance</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Grand Total</td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

*The CIE will be conducted for 50 marks and scaled to 30 marks. The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus. First Assignment should be submitted before the conduct of the first mid-term examinations, and the Second Assignment should be submitted before the conduct of the second midterm examinations. The subject wise attendance of each spell of instruction should be considered for the allocation of marks for attendance before each midterm examinations.

<table>
<thead>
<tr>
<th>Percentage of Attendance</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;90 and ≤100</td>
<td>5</td>
</tr>
<tr>
<td>&gt;85 and ≤90</td>
<td>4</td>
</tr>
<tr>
<td>&gt;80 and ≤85</td>
<td>3</td>
</tr>
<tr>
<td>&gt;78 and ≤80</td>
<td>2</td>
</tr>
<tr>
<td>&gt;75 and ≤78</td>
<td>1</td>
</tr>
</tbody>
</table>
The weightage for the midterm examination shall be given as 70% of the best performing midterm examination and 30% of the other midterm examination. The student shall appear for both midterm examinations, in case of any specific reason the student appears only one midterm examination, 70% weightage of that examination shall be considered.

8.2.2 Semester End Examination (SEE):
Semester End Examination (SEE) shall be conducted for all courses of UG Programmes at the end of the Semester. Duration of the examination is 3 hours. The paper setting and evaluation of all courses carried out by external examiners. The examiners will be selected by the Chief Controller of Examinations/Principal, from the panel of examiners submitted by the head of the respective department.

<table>
<thead>
<tr>
<th>Semester End Examination - UG</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Questions</td>
<td>No. of Questions</td>
</tr>
<tr>
<td>Choice Questions: For each question there will be an ‘either or choice’, which means that there will be two questions from each module and the student should answer either of the two questions.</td>
<td>5</td>
</tr>
</tbody>
</table>

8.3 Practical Courses:
8.3.1 Continuous Internal Evaluation (CIE):
CIE marks shall be awarded with a distribution of 40% for day - to-day performance and timely submission of lab records, 40% for internal lab exam (best out of two exams) and 20% for viva-voce. The CIE will be conducted for 50 marks and scaled to 30 marks.

8.3.2 Semester End Examination (SEE):
SEE marks shall be awarded with a distribution of 20% for design/procedure/schematic diagram of the given experiment, 40% for conduction of experiment, 20% for results and 20% for viva-voce. For conducting SEE (with duration of 3 hours), one internal examiner and one external examiner will be appointed by the Chief Controller of Examinations/Principal of the college. The external examiner should be selected from the outside college among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

8.4 Engineering Graphics:
CIE: There will be 30% of total marks for CIE shall be awarded with a distribution of 40% of the CIE marks for day to day performance and timely submission of drawing sheets and remaining 60% of CIE marks for midterm examinations.

The distribution of marks for CIE is given below
<table>
<thead>
<tr>
<th>Part</th>
<th>Type of Questions</th>
<th>No. Of Questions</th>
<th>Marks per Question</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part - A</td>
<td>Day – to – Day Work</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Mid – Term Examination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part - B</td>
<td>Choice questions (4 out of 6)</td>
<td>4</td>
<td>7.5</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

*The CIE will be conducted for 50 marks and scaled to 30 marks.

The distribution of marks for SEE is given below

<table>
<thead>
<tr>
<th>SEE for Engineering Graphics</th>
<th>Type of Questions</th>
<th>No. of Questions</th>
<th>Marks per Question</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Either or Choice from Each Module</td>
<td>5</td>
<td>14</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

8.5 Machine Drawing:

CIE: There will be 30% of total marks for CIE shall be awarded with a distribution of 40% of the CIE marks for day to day performance and timely submission of drawing sheets and remaining 60% of CIE marks for midterm examinations.

The distribution of marks for CIE is given below

<table>
<thead>
<tr>
<th>CIE for Machine Drawing</th>
<th>Type of Questions</th>
<th>No. of Questions</th>
<th>Marks per Question</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day to Day Work</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>I Mid Term Examination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part Drawing (4 out of 6)</td>
<td>4</td>
<td>7.5</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>II Mid Term Examination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly Drawing (1 out of 2)</td>
<td>1</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

*The CIE will be conducted for 50 marks and scaled to 30 marks.*
The distribution of marks for SEE is given below

<table>
<thead>
<tr>
<th>Type of Questions</th>
<th>No. of Questions</th>
<th>Marks per Question</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part A - Part Drawing (2 out of 4)</td>
<td>2</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Part B - Assembly Drawing (Compulsory Question)</td>
<td>1</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>

8.6 Projects:

8.6.1 Internship-III/Mini Project:

There shall be an Internship-III/Mini Project, in collaboration with an industry of their specialization. Students will register for this immediately after III year II semester (VI Semester) end examinations and pursue it during summer vacation. The evaluation of Mini project will be done at the end of IV Year I semester (VII semester). It shall be evaluated internally for 100 marks. The committee consisting Project Coordinator, Supervisor of the project and one senior faculty of the department will evaluate the mini Project and award appropriate Grade, based on the report submitted to the department and presentation provided by the student in front of the committee.

8.6.2 Project:

UG project work shall be carried out in two stages: Project Stage – I shall be evaluated internally during IV Year I Semester, Project Stage – II shall be evaluated externally during IV Year II Semester. Each stage will be evaluated for 100 marks. Student has to submit project work report at the end of each semester. First report includes project work carried out in IV Year I semester and second report includes project work carried out in IV Year I & II Semesters. SEE for both project stages shall be completed before the commencement of SEE Theory examinations.

8.6.2 (a) For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall evaluate the project work for 70 marks and project supervisor shall evaluate for 30 marks. Two reviews shall be conducted. Review-I will be conducted within a month from the commencement of class work (problem definition, objective, literature survey) and Review-II will be conducted before second mid examination (brief description and sample case study, progress of work, presentation and report submission). Average of the two reviews will be taken for 100 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) secures less than 40% marks. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such ‘one reappearance’
evaluation also, he has to reappear for the same in the subsequent semesters, as and when it is scheduled.

*The topics for industrial oriented mini project, seminar and Project Stage – I shall be different from one another.*

8.6.2 (b) Project Stage – II is the continuation of Project Stage – I. It shall be evaluated by the external examiner for 70 marks and the project supervisor shall evaluate it for 30 marks. Two reviews should be conducted. Review-I will be conducted within a month from the commencement of class work (progress of work, discussion and presentation) and Review-II will be conducted before second mid examination (progress of work, results, discussion, presentation and report submission). Average of the two reviews will be taken for CIE. The Project Viva-voce (SEE) shall be conducted by a committee comprising of an External Examiner, Head of the Department and Project Supervisor. In SEE marks, 20% for working model/simulation/data collection, 20% for report preparation and 60% for presentation and viva-voce. The external examiner should be selected by Chief Controller of Examinations/Principal from outside the college among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if student fails in such ‘one reappearance’ evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.7 Seminar:

For Seminar presentation, the student shall collect the information on a specialized topic, prepare a Technical Report and submit to the department at the time of seminar presentation. The seminar presentation (along with the technical report) shall be evaluated by a committee consisting of Seminar coordinator and two senior faculty members with appropriate grade. The seminar report shall be evaluated internally for 100 marks. There shall be no semester end examination for the seminar.

8.8 Non-Credit Courses:

8.8.1 Mandatory Courses:

Mandatory Non-Credit Courses offered in any semester, a ‘Satisfactory / Not Satisfactory’ shall be awarded to the student based on the performance in both CIE and SEE.

8.8.2 Audit Courses:

Audit Courses offered in any Semester, a ‘Satisfactory Participation Certificate’ shall be issued to the student from the concerned authorities, only after securing $\geq 65\%$ attendance in such a course. Internship program is also conducted under the category of Audit Courses. The student needs to submit a detailed report to the department after internship program. No marks or Letter Grade shall be allotted for these activities.
9 Grading Procedure

9.1 Grades will be awarded to indicate the performance of each student in each theory subject, or Lab/ Practical or Seminar or Project or Mini-Project or Minor Course etc., based on the % of marks obtained in CIE + SEE both taken together as specified in Item No. 9 and a corresponding Letter Grade shall be given.

9.2 As a measure of the student’s performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed.

<table>
<thead>
<tr>
<th>% of Marks</th>
<th>Grade Points</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥90</td>
<td>10</td>
<td>(Out Standing)</td>
</tr>
<tr>
<td>≥80 to &lt; 90</td>
<td>9</td>
<td>A+ (Excellent)</td>
</tr>
<tr>
<td>≥70 to &lt; 80</td>
<td>8</td>
<td>A (Very Good)</td>
</tr>
<tr>
<td>≥60 to &lt; 70</td>
<td>7</td>
<td>B+ (Good)</td>
</tr>
<tr>
<td>≥50 to &lt; 60</td>
<td>6</td>
<td>B (Average)</td>
</tr>
<tr>
<td>≥40 to &lt; 50</td>
<td>5</td>
<td>C(Pass)</td>
</tr>
<tr>
<td>&lt; 40</td>
<td>0</td>
<td>F (Fail)</td>
</tr>
<tr>
<td>Absent</td>
<td>0</td>
<td>Ab</td>
</tr>
</tbody>
</table>

9.3 A student obtaining ‘F’ Grade in any subject shall be considered ‘Failed’ and will be required to reappear as ‘Supplementary Candidate’ in the Semester End Examination (SEE) as and when conducted. In such cases, his / her Internal Marks (CIE Marks) in those subject(s) will remain same as those he / she obtained earlier.

9.4 A Letter Grade does not imply any specific % of marks.

9.5 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of ‘Grade Improvement’ or ‘SGPA / CGPA Improvement’. However, he / she has to repeat all the Subjects/ Courses pertaining to that semester, when he / she is detained (as listed in Items Nos.7.7 & 7.8).

9.6 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Mandatory non-credit Courses). Then the corresponding ‘Credit Points’ (CP) are computed by multiplying the Grade Point with credits for that particular Subject/ Course.

\[
\text{Credit Points (CP)} = \text{Grade Point (GP)} \times \text{Credits} \quad \text{For a Course}
\]

9.7 The Student passes the Subject/ Course only when he / she gets GP ≥ 5 (‘C’ Grade or above).

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a semester by the Total Number of Credits registered during that semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

\[
\text{SGPA} = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i} \quad \text{for each semester}
\]

where ‘i’ is the subject indicator index (takes into account all subjects in a semester), ‘N’ is the number of Subjects ‘REGISTERED’ for the semester (as specifically required and listed under the Course Structure of the parent Department) is the number of credits allotted to the i^{th} subject and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} subject.

9.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all semesters considered for registration.
The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered courses in ALL semesters and the total number of credits registered in ALL the semesters. CGPA is rounded off to TWO decimal places. CGPA is thus computed from the II semester onwards, at the end of each semester, as per the formula.

\[ \text{CGPA} = \frac{\sum_{j=1}^{M} C_j G_j}{\sum_{j=1}^{M} C_j} \]

... for all ‘S’ semesters registered (i.e., up to and inclusive of ‘S’ semesters, \( S \geq 2 \))

where ‘M’ is the TOTAL number of subjects (as specifically required and listed under the course structure of the parent department) the student has ‘REGISTERED’ from the 1st Semester onwards up to and inclusive of the semester ‘S’ (obviously \( M > N \)), ‘j’ is the subject indicator index (takes in to account all subjects from ‘1’ to ‘S’ semesters) is the number of credits allotted to the \( j^{th} \) subject, and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that \( j^{th} \) subject. After registration and completion of 1 Year I Semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

**ILLUSTRATION OF CALCULATION OF SGPA**

<table>
<thead>
<tr>
<th>Course/ Subject</th>
<th>Credits</th>
<th>Grade Points</th>
<th>Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course 1</td>
<td>3</td>
<td>A</td>
<td>3 x 8 = 24</td>
</tr>
<tr>
<td>Course 2</td>
<td>3</td>
<td>O</td>
<td>3 x 10 = 30</td>
</tr>
<tr>
<td>Course 3</td>
<td>3</td>
<td>C</td>
<td>3 x 5 = 15</td>
</tr>
<tr>
<td>Course 4</td>
<td>3</td>
<td>B</td>
<td>3 x 6 = 18</td>
</tr>
<tr>
<td>Course 5</td>
<td>3</td>
<td>A+</td>
<td>3 x 9 = 27</td>
</tr>
<tr>
<td>Course 6</td>
<td>1.5</td>
<td>B</td>
<td>1.5 x 6 = 09</td>
</tr>
<tr>
<td>Course 7</td>
<td>1.5</td>
<td>A</td>
<td>1.5 x 8 = 12</td>
</tr>
<tr>
<td>Course 8</td>
<td>2</td>
<td>A</td>
<td>2 x 8 = 16</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td></td>
<td>Total Credit Points = 151</td>
</tr>
</tbody>
</table>

\[ \text{SGPA} = \frac{151}{20} = 7.55 \]

**ILLUSTRATION OF CALCULATION OF CGPA:**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Credits</th>
<th>SGPA</th>
<th>Credits X SGPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester I</td>
<td>18</td>
<td>7</td>
<td>18 X 7 = 126</td>
</tr>
<tr>
<td>Semester II</td>
<td>20</td>
<td>6</td>
<td>20 X 6 = 120</td>
</tr>
<tr>
<td>Semester III</td>
<td>20</td>
<td>6.5</td>
<td>20 X 6.5 = 130</td>
</tr>
<tr>
<td>Semester IV</td>
<td>20</td>
<td>6</td>
<td>20 X6 = 120</td>
</tr>
<tr>
<td>Semester V</td>
<td>21</td>
<td>5.75</td>
<td>21 X 5.75 = 120.75</td>
</tr>
<tr>
<td>Semester VI</td>
<td>20</td>
<td>7.25</td>
<td>20 X 7.25 = 145</td>
</tr>
<tr>
<td>Semester VII</td>
<td>21</td>
<td>8</td>
<td>21 X 8 = 168</td>
</tr>
<tr>
<td>Semester VIII</td>
<td>20</td>
<td>8.5</td>
<td>20 X 8.5 = 170</td>
</tr>
<tr>
<td></td>
<td>160</td>
<td></td>
<td>1099.75</td>
</tr>
</tbody>
</table>

\[ \text{CGPA} = \frac{1099.75}{160} = 6.87 \]

9.10 For merit ranking or comparison purposes or any other listing, ONLY the ‘ROUNDED OFF’ values of the CGPAs will be used.

9.11 For calculations listed in Item Nos.9.6 to 9.10, performance in failed Subjects/Courses (securing ‘F’ Grade) will also be taken into account and the credits of such
Subjects/Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.

9.12 Passing Standards:
9.12.2 A student shall be declared successful or ‘passed’ in a semester, only when he / she gets a SGPA ≥ 5.00 (at the end of that particular semester); and a student shall be declared successful or ‘passed’ in the entire UGP, only when he / she gets a CGPA ≥ 5.00; subject to the condition that he / she secures a GP ≥ 5 (‘C’ Grade or above) in every registered Subject/ Course in each semester (during the entire UGP) for the degree award, as required.

9.12.3 Inspite of securing ‘P’ Grade or above in some (or all)Subjects/ Courses in any semester, if a student receives a SGPA < 5.00 and/ or CGPA < 5.00 at the end of such a semester, then he / she ‘may be allowed’ (on the ‘specific recommendations’ of the Head of the Department and subsequent approval from the Principal) (i) to go into the next subsequent semester (subject to fulfilling all other attendance and academic requirements as listed under Items Nos. 7&8);(ii) to ‘improve his / her SGPA of such a semester (and hence CGPA) to 5.00 or above’, by reappearing for ONE or MORE (as per student’s choice) of the same course(s) in which he / she has secured ‘P’ Grade(s) in that semester, at the Supplementary Examinations to be held in the next subsequent semester(s). In such cases, his / her Internal Marks (CIE Marks) in those subject(s) will remain same as those he / she obtained earlier. In these considerations, the newly secured Letter Grades will be recorded and taken into account for calculation of SGPA and CGPA, only if there is an improvement.

9.12.4 A student shall be declared successful in any Non-Credit Course, if he / she secures a ‘Satisfactory Participation Certificate’ for that Audit Course and “Satisfactory Grade” for Mandatory Course.

9.13 After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the registered students of that semester, indicating the Letter Grades and credits earned. It will show the details of the courses registered (Course Code, Title, No. of Credits and Grade Earned etc.), Credits earned, SGPA and CGPA.

10 Declaration of Results
10.1 Computation of SGPA and CGPA are done using the procedure listed in items 9.6 to 9.10.

10.2 For final % of marks equivalent to the computed final CGPA, the following formula may be used …

\[ \text{% of Marks} = (\text{final CGPA} - 0.5) \times 10 \]

11 Award of Degree
11.1 A student who register for all the specified courses as listed in the Course Structure, satisfies all the course requirements, passes all the examinations prescribed in the entire UG Programme (UGP) within the specified period (refer 4.1) and secures the required 160 Credits (with CGPA ≥ 5.0) shall be declared to have ‘QUALIFIED’
for the award of the B.Tech. Degree in the chosen branch of engineering as selected at the time of admission.

11.2 A student who qualifies for the award of the degree as listed in Item 11.1, shall be placed in the following classes:

<table>
<thead>
<tr>
<th>Class Awarded</th>
<th>CGPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class with Distinction</td>
<td>≥ 8.00</td>
</tr>
<tr>
<td>First Class</td>
<td>≥ 6.50 and &lt; 8.00</td>
</tr>
<tr>
<td>Second Class</td>
<td>≥ 5.50 and &lt; 6.50</td>
</tr>
<tr>
<td>Pass Class</td>
<td>≥ 5.00 and &lt; 5.50</td>
</tr>
</tbody>
</table>

11.3 A student with final CGPA (at the end of the UGP) <5.00 will not be eligible for the award of the degree.

11.4 Students will be eligible for the award of ‘Gold Medal’, if he/she should have passed all the subjects/courses in first appearance within the first academic years (or eight sequential semesters) from the date of commencement of first year first semester and should have secure CGPA ≥ 8.00 at the end of eight sequential semesters.

11.5 A student will be eligible to get under graduate with honours or additional minor engineering if he/she completes an additional 20 credits through MOOCs.

12 Withholding of Results
If the student has not paid fees to college at any stage or has pending dues against his / her name due to any reason whatsoever or if any case of indiscipline is pending against him, the result of the student may be witheld and he / she will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

13 Transitory Regulations
A. For students detained due to shortage of attendance:
1. A student who has been detained in I year of MR14/ MR15/ MR17 regulations due to lack of attendance, shall be permitted to join I year I Semester of MR18 regulations and he / she is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.
2. A student who has been detained in any semester of II, III and IV years of MR14/ MR15 regulations for want of attendance shall be permitted to join the corresponding semester of MR18 regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The MR18 academic regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further transitory regulations.

B. For students detained due to shortage of credits:
3 A student of MR14/ MR15 (2015-16 and 2016-17 admitted students)/ MR 17 regulations, who has been detained due to lack of credits, shall be promoted to the next semester of MR18 regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is
required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The MR18 academic regulations are applicable to a student from the year of readmission onwards. See rule (C) for further Transitory Regulations.

C. **For readmitted students in MR 18 regulations:**

1. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
2. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including MR18 regulations. The performance evaluation of the student will be done after the exemption of two subjects if total credits acquired are ≤ 206, three subjects if total credits acquired are > 206 (see MR18 regulations for exemption details).
3. If a student readmitted to MR18 regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in MR18 regulations will be substituted by another subject to be suggested by the College Academic Committee (CAC).

**Note:** If a student readmitted to MR18 regulations, has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in MR18 regulations, the departments concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

14 **Student Transfers**

14.1 There shall be no branch transfers after the completion of admission process.

14.2 The students seeking transfer to MALLA REDDY ENGINEERING COLLEGE (Autonomous)-MREC(A) from various other Universities/ Institutions have to pass the failed subjects which are equivalent to the subjects of MREC(A) and also pass the subjects of MREC(A) which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of MREC(A), the students have to study those subjects in MREC(A) inspite of the fact that those subjects are repeated.

14.3 The transfer students from other Universities / Institutions to MREC(A) who are on rolls will be provided one chance to write internal examinations in the failed subjects and/or subjects not studied as per the clearance letter issued by the JNTUH.

15 **Scope**

(i) Where the words “he”, “him”, “his”, occur in the write – up of regulations, they include “she”, “her”, “hers”.

(ii) Where the words “Subject” or “Subjects”, occur in these regulations, they also imply “Course” or “Courses”.

(iii) The academic regulations should be read as a whole, for the purpose of any interpretation.

(iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the College Academic Committee headed by the Principal is final.
Academic Regulations for B.Tech.(Lateral Entry Scheme)  
w.e.f the A Y 2019-20  
Eligibility for award of B. Tech. Degree(LES) 

1. The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

2. The student shall register for 122 credits and secure 122 credits with CGPA ≥ 5 from II year to IV year B.Tech. programme (LES) for the award of B.Tech. degree. **Out of the 122 credits secured, the student can avail exemption up to 6 credits**, that is, one open elective subject and one professional elective subject or two professional elective subjects resulting in 114 credits for B.Tech. programme performance evaluation.

3. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech.(LES).

5. **Promotion Rule:**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Promotion</th>
<th>Conditions to be fulfilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Second year first semester (III Semester) to second year second semester (IV Semester)</td>
<td>Regular course of study of second year first semester (III Semester).</td>
</tr>
</tbody>
</table>
| 2     | Second year second semester (IV Semester) to third year first semester (V Semester). | Regular course of study of second year second semester (IV Semester)  
Must have secured at least 60% credits up to second year second semester (IV Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3     | Third year first semester (V Semester) to third year second semester (VI Semester) | Regular course of study of third year first semester (V Semester). |
| 4     | Third year second semester (VI Semester) to fourth year first semester (VII Semester) | Regular course of study of third year second semester (VI Semester)  
Must have secured at least 60% credits up to third year second semester (VI Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5     | Fourth year first semester (VII Semester) to fourth year second semester (VIII Semester) | Regular course of study of fourth year first semester (VII Semester). |

6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).
### MALPRACTICES RULES

**DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Nature of Malpractices/Improper conduct</th>
<th>Punishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (a)</td>
<td>Possesses or keeps accessible in examination hall any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)</td>
<td>Expulsion from the examination hall and cancellation of the performance in that course only.</td>
</tr>
<tr>
<td>2</td>
<td>Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to that course of the examination (theory or practical) in which the candidate is appearing.</td>
<td>Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that semester. The hall ticket of the candidate shall be cancelled.</td>
</tr>
<tr>
<td>3</td>
<td>Impersonates any other candidate in connection with the examination.</td>
<td>The student who has impersonated shall be expelled from examination hall. The candidate is also debarred</td>
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<tr>
<td>4</td>
<td><strong>Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.</strong></td>
<td>and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination (including practical’s and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.</td>
</tr>
<tr>
<td>5</td>
<td><strong>Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.</strong></td>
<td>Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The student is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Refuses to obey the orders of the Chief</strong></td>
<td>Cancellation of the performance in that course.</td>
</tr>
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In case of students of the college, they
Controller of Examinations (CCE) / Controller of Examinations (CE) / Assistant Controller of Examinations (ACE) / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police cases registered against them.

Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.

Expulsion from the examination hall and cancellation of performance in that course and all the other courses the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the student is subject to the academic regulations in
<p>| | | |</p>
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<tr>
<td><strong>8</strong></td>
<td><strong>Possess any lethal weapon or firearm in the examination hall.</strong></td>
<td><strong>Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat.</strong></td>
</tr>
<tr>
<td><strong>9</strong></td>
<td><strong>If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.</strong></td>
<td><strong>Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.</strong></td>
</tr>
<tr>
<td>10</td>
<td>Comes in a drunken condition to the examination hall.</td>
<td>Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester.</td>
</tr>
<tr>
<td>11</td>
<td>Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.</td>
<td>Cancellation of the performance in that course and all other courses the student has appeared including practical examinations and project work of that SEE.</td>
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<td>12</td>
<td>If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the CCE for further action toward suitable punishment.</td>
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**Note:** *The student(s) found indulging in malpractices during the CIE also will be punished based on the recommendations of the College Academic Committee.*

**Malpractices identified by squad or special invigilators**

1. Punishments to the students as per the above guidelines.
# MALLA REDDY ENGINEERING COLLEGE
(Autonomous)
Maisammaguda, Dhulapally (Via & Post) Kompally, Secunderabad-500100
Department of INFORMATION TECHNOLOGY
COURSE STRUCTURE for AY 2018-19

## I SEMESTER

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<tr>
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**Total** 12 2 8 18

**Total Contact Hours: 22**

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**Total Contact Hours:** 28

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**Professional Elective-I**

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Prerequisite: NIL

Course Objectives:
The objective of this course is to improve the English Language competency of the students, which emphasizes on all language components namely grammar, vocabulary, prose, short stories. Further, it also helps in developing the skills of Reading and Writing. As a result students are equipped to study the academic subjects more effectively using the theoretical and practical components of the English syllabus.

MODULE – I: [10 Periods]

Essay : “Minimalism—Live a Meaningful Life” by Joshua Millburn and Ryan Nicodemus
Poem  : “Road Not Taken” by Robert Frost
Vocabulary : Formation of Words, Prefixes, Suffixes, and Root Words
Grammar : Articles and Prepositions
Reading : Skimming and Scanning
Writing : Introduction to Writing Skills, Characteristics of Effective Writing
MODULE - II: [10 Periods]
Essay: “Knowledge Society” an excerpt from Ignited Minds by A.P.J Abdul Kalam
Poem: “Life” by Sarojini Naidu
Vocabulary: Homonyms, Homophones, Homographs
Grammar: Sentence Structures, Voice – Exercises
Reading: Paragraph Writing- use of cohesive devices; Arranging Jumbled Sentences into Paragraph and Punctuation

MODULE - III: [10 Periods]
Short Story: “Half a Rupee Worth” by R.K Narayan
Poem: “If” by Rudyard Kipling
Grammar: Tense, Aspect and Concord
Vocabulary: Idiomatic Expressions; Phrasal Verbs
Reading: Reading for Theme and Gist.
Writing: Essay Writing, Describing, Defining and Classifying

MODULE - IV: [09 Periods]
Biography: “Jesse Owens”
Poem: “I too Sing America” by Langston Hughes
Grammar: Question Tags; Degrees of Comparison
Vocabulary: One Word Substitutions; Synonyms and Antonyms
Reading: Reading for Interpretation
Writing: Letter Writing- Both Formal and Informal

MODULE - V: [09 Periods]
Essay: “Pecuniary Independence” by P.T Barnum
Poem: “Human Family” by Maya Angelou
Grammar: Direct and Indirect Speech, Misplaced Modifiers
Vocabulary: Integrated Exercises in Vocabulary
Reading: Reading for Specific Purposes, Reading Comprehension
Writing: Summarizing, Redundancies and Clichés
* Exercises from the texts not prescribed shall also be used for classroom tasks.

TEXTBOOKS:

REFERENCES:

E-RESOURCES:
1. http://www.slideshare.net/aszardini/

Course Outcomes:
After completion of the course, students will be able to:
1. Use english considerably well in written and spoken.
2. Enrich language accurately and fluently.
3. Employ extensive and intensive reading skills
4. Gain confidence in using english language and skills for writing in real life situations.
5. Use standard grammar, punctuation, and spelling in documents.
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**Course Objectives:**
To learn Types of matrices and their properties, rank of the matrix and applying this concept to know the consistency and solving the system of linear equations. To find Eigen values and eigenvectors and to reduce the quadratic form to canonical form. To understand Concept of Sequence and series. Geometrical approach to the mean value theorems and their application to the mathematical problems.

**Module - I: Matrices** [12 Periods]
Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. LU - Decomposition Method.

**Module - II: Eigen values and Eigen vectors** [14 Periods]
Linear Transformation and Orthogonal Transformation: Eigen values and Eigen vectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

**Module - III: Sequences & Series** [13 Periods]
A:Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.
Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert’s ratio test;
B:Raabe’s test; Cauchy’s Integral test; Cauchy’s root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

**Module - IV: Fourier Series** [12 Periods]

**Module - V: Calculus** [14 Periods]
Mean value theorems: Rolle’s theorem, Lagrange’s Mean value theorem with their Geometrical Interpretation and applications, Cauchy’s Mean value Theorem. Taylor’s Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

TEXT BOOKS:

REFERENCE BOOKS:

E-Resources:
2. https://www.math.cmu.edu/~wn0g/2ch6a.pdf (Differential Calculus)
5. http://nptel.ac.in/courses/108106075/8 (Fourier Series)

Course Outcomes:
At the end of the course, students will be able to
1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
2. Find the Eigen values and Eigen vectors and Reduce the quadratic form to canonical form using orthogonal transformations.
3. Analyze the nature of sequence and series.
4. Determine Fourier series for different functions.
5. Solve the applications on the mean value theorems and evaluate the improper integral using beta and gamma functions,
## CO- PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisites: Fundamentals of Physics

Course Objectives:
The main objective of this course is to provide an adequate exposure and develop insight about the basic principles of semiconductor physics along with the possible applications.

MODULE-I Principles of Quantum Mechanics  [12 Periods]
Qualitative discussion on black body radiation spectrum problem, Photo electric effect concept and Einstein’s explanation; Postulates of Quantum mechanics, Louis de Broglie's concept of matter waves, Davisson and Germer’s experiment, Heisenberg’s Uncertainty Principle, Schrödinger’s Time Independent Wave Equation, Physical Significance and properties of the Wave Function; Energy of a particle in One Dimensional infinite Potential well.

MODULE –II Band Theory of Solids  [12 Periods]
Free electron theory of metals(Qualitatively), Fermi Level, Density of Energy States and Energy Band Diagrams, Bloch theorem for particle in a periodic potential (Qualitatively), Kronig-Penny Model(Qualitatively), E-K Diagram, Origin of Energy Bands in solids, Effective mass of an electron, Distinction between Metals, Semiconductors and Insulators.

MODULE –III Semiconductor Physics  [12 Periods]
A: Intrinsic and Extrinsic Semiconductors, Expression for carrier concentration in intrinsic and extrinsic semiconductor, Qualitative treatment of Fermi energy level in Intrinsic and extrinsic semiconductors,
B: Direct and indirect band gap semiconductors, Carrier generation and Recombination, Drift and Diffusion, Equation of Continuity.

MODULE –IV Lasers and Fiber Optics:  [14 Periods]
Fiber Optics: Introduction, Optical fiber as a dielectric wave guide, Total Internal Reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibers, Losses associated with optical fibers, Applications optical fibers.
MODULE –V Electromagnetic Theory             [14   Periods]
Gradient of Scalar field and its Physical Significance; Divergence and Curl of Vector field; Qualitative treatment of Gauss’s Law of electrostatics and Gauss law of magnetostatics, Ampere’s law and its modification, Faraday’s law of electromagnetic induction, Induced E.M.F in a conductor, Lenz’s Law, Maxwell equations in differential form, wave equation for free space.

Text Books:

Reference Books:

E-RESOURCES
5. http://nptel.ac.in/courses/113104012/
6. https://www.youtube.com/watch?v=jnjjWI1s9_s&list=PLzJaFd3A7DZse2tQ2qUFChSiCj7jBidO0
7. https://www.youtube.com/watch?v=4a0FbQdH3dY

Course Outcomes:
At the end of the course, students will be able to
1. Acquire the theoretical information about matter in terms of quantum physics
2. Analyze the formation the bands thereby classification of materials on the basis of transport properties.
3. Understand the fundamentals of semiconductor physics and also the Optoelectronics
4. Be aware of the concepts and applications of LASER and Optical fibers.
5. Apply basic knowledge on electromagnetic principles and using these wave equations for the propagation
### CO- PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisites: NIL

Course Objectives:
This course provides the fundamental concepts of computers and introduce to the students to the field of programming using C language, apply the control structures, iterations statements, arrays, functions, strings, pointers, structures, unions and files. This course also explains the concepts of searching and sorting techniques in C language.

MODULE I: Fundamentals and Introduction to ‘C’ Language [11 Periods]
Introduction to ‘C’ Language: History, Simple C Program, Identifiers, Preprocessor Directives- Include and define, Basic data types, User-defined data types, Variables, Constants, Type qualifiers, Managing Input / Output, Operators, Precedence and Associativity, Expression Evaluation, Type conversions, Simple ‘C’ Programming examples.

MODULE II: Control Statements & Arrays [09 Periods]
Control Statements: Conditional statements- if and switch statements, ternary operator?: , Loop Control Statements – while, for, do-while, break, continue and goto statements.
Arrays: Basic concepts, One-dimensional arrays, Two–dimensional arrays, Multi-dimensional arrays.

MODULE III: Strings & Pointers [09 Periods]
A: Basic concepts, String Input / Output functions, Arrays of strings, String handling functions.
B: Basic concepts, Pointer arithmetic, Pointers and strings, Pointers and arrays, Dynamic Memory Allocation.

MODULE IV: Functions & Derived Types [09 Periods]
Functions - Basics, User defined functions, Inter function communication, Library functions, Storage Classes-auto, register, static, extern, Scope rules, Array and string manipulations using functions, Recursive functions, Pointers and functions.
Derived types - Structures – Basic concepts, Nested structures, Arrays of structures, Structure manipulations using functions, Pointers to structures, Self-referential structures, Unions, bit fields

MODULE V: File I/O, Sorting and Searching [10 Periods]
File I/O: Basic concepts, Text files and Binary files, File input / output operations, File status functions (error handling), Command-Line Arguments, C programming examples.
Sorting and Searching: Sorting - selection sort, bubble sort, insertion sort, searching - linear and binary searching methods.

TEXT BOOKS

REFERENCES

E-RESOURCES
5. http://onlinevideolecture.com/ebooks/?subject=C-Programming

Course Outcomes:
At the end of the course, students will be able to
1. Understand the basic terminology, write, compile and debug programs in computer programming.
2. Apply different types of control structures and arrays in a computer programming.
3. Develop programs that make use of concepts such as strings and pointers in C language.
4. Compare parameter passing techniques, structures and unions in computer programming.
5. Analyze file operations, searching and sorting methods.

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2018-19 Onwards (MR-18) | MALLA REDDY ENGINEERING COLLEGE (Autonomous) | B.Tech. I Semester
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Code: 80H02 | ENGLISH LANGUAGE LAB (Common for EEE, ECE, CSE and IT) | L T P
Credits: 1 | | - - 2

Prerequisite: NIL

Course Objectives:
To sensitize the students to the intelligibility in their pronunciation of English, speech sounds, word accent, intonation and rhythm. It also helps to improve the fluency in spoken English and make them aware of nuances of major skills, viz listening and speaking skills. Hence it helps to train the students to understand nuances of both verbal and non verbal communication during all activities. The purpose of this course is to develop confidence levels of the students and to face the audience and participate in public speaking.

Listening Skills:
Objectives:
1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language to be able to recognize them, awareness regarding stress and recognize and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:
Objectives:
1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Just A Minute (JAM) Sessions.

**English Language Communication Skills Lab shall have two parts:**
- **a. Computer Assisted Language Learning (CALL) Lab**
- **b. Interactive Communication Skills (ICS) Lab**

The following course content is prescribed for the English Language Communication Skills Lab
MODULE - I:
CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab: Ice-Breaking activity and JAM session
Listening: listening for sounds in context, for ideas.
Speaking: ideation and translation of ideas into sentences.

MODULE - II:
CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
Listening: listening for specific purposes, for details.
Speaking: speaking in the above situations with clarity, connectivity, maintaining voice characters.

MODULE - III:
CALL Lab: Word accent and Listening Comprehension-reading(aloud) meaningfully.
ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.
Listening: listening for intelligible English
Speaking: formal and informal conversations, register.

MODULE - IV:
CALL Lab: Intonation and Common errors in Pronunciation- reading aloud(evaluating through recording).
ICS Lab: Extempore- Public Speaking, Oral Presentation Skills
Listening: note taking and listening for speaker’s tone/attitude
Speaking: organizing, connecting ideas and sentences, short forms in spoken English, errors in spoken English

MODULE - V:
CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab: Information Transfer, Debate

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

REFERENCES:
2. Hughes, John and Mallett, Andrew: *Successful Presentations: DVD and Student's Book Pack: A Video Series Teaching Business Communication Skills for Adult Professionals*

**E-RESOURCES:**

**Course Outcomes:**
At the end of the course, students will be able to
1. Understand the nuances of language through audio-visual experience and group activities

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2. Neutralize the accent for intelligibility
3. Realize the importance of listening skills and speaking skills and their application in real life situations.
4. Recognize significance of non-verbal communication and develop confidence to face audience and shed inhibitions.
5. Speak with clarity and confidence thereby enhance employability skills of the students.
Course objectives:
The main objective of this course is to provide the necessary exposure to the practical aspects, which is an essential component for learning science.

List of Experiments:

1. **Planck’s constant:**
   To determine Planck’s constant using Photo electric effect.

2. **Energy band – gap of a semiconductor:**
   To determine the energy band gap of a semiconductor

3. **V-I and P-I characteristics of light emitting diode**
   Plot V-I and P-I characteristics of light emitting diode

4. **Laser diode:**
   To study the Characteristics of Laser diode

5. **Solar Cell:**
   To study the V-I Characteristics of solar cell

6. **LCR Circuit:**
   To determination of resonant frequency, bandwidth and quality factor of RLC circuit.

7. **Numerical Aperture of an Optical fiber:**
   To determine the Numerical aperture of the given fiber

8. **Bending Loss of a Fiber:**
   To determine the bending loss of the given fiber.

9. **Light Dependent Resistance (LDR):**
   To determine the characteristics of a LDR

10. **Stewart and Gee’s experiment**
    Determination of Magnetic field along the axis of current carrying circular coil
11. **Torsional Pendulum:**
   To determine the rigidity modulus of a given wire.

12. **Sonometer**
   To verify the frequency of AC power supply

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**Course Outcomes:**
At the end of the course, students will be able to
1. Develop skills to impart practical knowledge in real time solution.
2. Understand principle, concept, working, application and comparison of results with theoretical calculations.
3. Design new instruments with practical knowledge.
4. Understand measurement technology
5. Use of new instruments and real time applications in engineering studies.

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**CO – PO Mapping**
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisite: NIL

Course Objectives:
This course provides the fundamental concepts of programming using C language, apply
the control structures, iterations statements, arrays, functions, strings, pointers, structures,
unions and files. This course also explains the concepts of searching and sorting
techniques in C language.

Software Requirements: Turbo C

List of Programs:
1. a. Practice various Internal and External DOS Commands.
   b. Implement various programs logics using algorithms and flowcharts.
   c. Write sample examples of C programs to implement basic operations.
2. a. Write a C program to find smallest and largest of given three numbers.
   b. Write a C program to find the roots of a quadratic equation.
3. a. Write a C program to find the sum of individual digits of a positive integer.
   b. A Fibonacci sequence is defined as follows: the first and second terms in the
      sequence are 0 and 1. Subsequent terms are found by adding the preceding two
      terms in the sequence.
   c. Write a C program to generate the first n terms of the sequence.
4. a. Write a C program to find whether the given number is palindrome, perfect,
     Armstrong or strong.
   b. Write a C program to generate all the prime numbers between n1 and n2, where
     n1 and n2 are values supplied by the user.
5. Write C programs that use both recursive and non-recursive functions
   a. To find the factorial of a given integer.
   b. To find the GCD (greatest common divisor) of two given integers.
6. a. Write a C program to find both the largest and smallest number in a list of
     integers.
   b. Write a C program that uses functions to perform the following:
      i. Addition of Two Matrices
      ii. Multiplication of Two Matrices
7. a. Write a C program that uses functions to perform the following operations:
      i. To insert a sub-string into given main string from a given position.
      ii. To delete n characters from a given position in a given string.
   b. Write a C program to determine if the given string is a palindrome or not
   c. Write a C program to find substring in a given string.
   d. Write a C program to count the lines, words and characters in a given text.
8. a. Write a C program to implement functions arguments with different returns
     values.
b. Write a C program to implement call by value and call by reference using functions.

9. a. Write a C program to find grades of a student’s using structures and unions.
   b. Write a C program to implement nested structures.

10. a. Write a C program which copies one file to another.
     b. Write a C program to command line arguments.

11. a. Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search.
    b. Write a C program that uses recursive and non-function to search for a Key value in a given sorted list of integers using Binary search.

12. a. Write a C program that implements the Selection sort method to sort a given array of integers in ascending order.
    b. Write a C program that implements the Bubble sort method to sort a given list of names in ascending order.

TEXT BOOKS

REFERENCES:

Course Outcomes:
At the end of the course, students will be able to
1. Analyze concepts in problem solving do programming in C language and write diversified solutions using C language.
2. Identify situations where computational methods and computers would be useful.
3. Understand the programming tasks using techniques learned and write pseudo-code.
4. Compare the program on a computer, edit, compile, debug, correct, recompile and run it.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

5. Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task

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Course Objectives:
To understand the usage of hand tools, acquire the skills in model / pattern making and familiarize with various work materials and tools.

1. Trades for Exercises:
   At least two exercises from each trade:
   1. Carpentry
   2. Fitting
   3. Tin-Smithy
   4. House-wiring
   5. Foundry
   6. Arc welding

2. Trades for Demonstration & Exposure
   1. Machine shop
   2. Plumbing
   3. Wood working lathe
   4. Identification of Electronic Components
   5. Black smithy
   6. Computer Peripherals

Course Outcomes
At the end of the course, students will be able to
1. Knowledge of carpentry process and methods used in the design and fabrication, installation, maintenance and repair of structures and fixtures (e.g., furniture, cabinets) to accomplish work assignments.
2. Assembling together of part and removing metals to secure the necessary joint by using fitting and welding.
3. Understand the hardware components of house wiring.
4. Understand the manufacturing process using machine shop.
5. Analyze the different types of computer Peripherals
CO- PO Mapping
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2018-19 Onwards (MR-18)
MALLA REDDY ENGINEERING COLLEGE (Autonomous) B.Tech. II Semester

Code: 80B06 Engineering Mathematics -II (Common for EEE, ECE, CSE and IT )
Credits: 4

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Prerequisite: Basic Calculus

Course Objectives:
To learn
• Methods of solving the differential equations of first and higher order.
• Evaluation of multiple integrals and their applications
• The physical quantities involved in engineering field related to vector valued functions
• The basic properties of vector valued functions and their applications to line, surface and volume integrals Partial differentiation, concept of total derivative
• Finding maxima and minima of function of two and three variables

Module - I: First Order ODE [12 Periods]
Exact, linear and Bernoulli’s equations; Applications: Newton’s law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut’s type.

Module - II: Ordinary Differential Equations of Higher Order [12 Periods]
Rules for finding Complementary function-Particular integral (Non-homogeneous term of the type $e^{ax}, \sin bx / \cos bx, x^n, e^{ax}V(x), x^nV(x)$only), Method of variation of parameters. Equations reducible to constant coefficients - Cauchy - Euler and Legendre’s equations.

Module - III: Multivariable Calculus [12 Periods]
A: Definitions of Limit and continuity. Partial Differentiation; Euler’s Theorem; Total derivative; Jacobian; Functional dependence & independence
B: Maxima and minima of functions of two variables and three variables using Lagrange’s method of undetermined multipliers.
Module - IV: Multiple Integrals [12 Periods]
Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Module - V: Vector Calculus [12 Periods]
Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Scalar potential functions. Solenoidal and Irrotational vectors. Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXTBOOKS:

REFERENCES:

E Resources
3. http://nptel.ac.in/courses/122104017/28 (Multiple Integrals)
4. http://nptel.ac.in/courses/122107037/20 (Differential Equations of first order and first degree)
5. http://nptel.ac.in/courses/122104017/28 (Multiple Integrals)

Course Outcomes:
At the end of the course, students will be able to
1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems
3. Determine extreme values of functions.
4. Evaluate the multiple integrals and apply the concept to find areas, volumes.
5. Evaluate the line, surface and volume integrals and converting them from one to another

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CO- PO, PSO Mapping
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Prerequisites: NIL

Course objectives:
The purpose of this course is to emphasize the relevance of fundamentals of chemical sciences in the field of engineering and to provide basic knowledge on atomic- molecular orbital’s, electrochemistry, batteries, corrosion and the role of water as an engineering material in domestic-industrial use. They will also impart the knowledge of stereochemistry, understanding the chemical reaction pathway mechanisms and synthesis of drugs.

Module I: Water and its treatment [12 Periods]

Module II: Molecular structure and Theories of Bonding: [12 Periods]
Introduction to Molecular orbital Theory. Linear Combination of Atomic Orbital’s (LCAO), significance of bonding and anti-bonding molecular orbital, Conditions for the formation of molecular orbital’s. Molecular orbital energy level diagrams of diatomic molecules - N₂, O₂ and F₂. Introduction to coordination compounds- ligand-coordination number (CN) - spectrochemical series. Salient features of crystal field theory, Crystal field splitting of transition metal complexes in octahedral ( [CoF₆]³⁻ and [Co(CN)₆]³⁻ ) and tetrahedral ([NiCl₄]²⁻ and [Ni (CN)₄]²⁻ ) fields - magnetic properties of complexes. Band structure of solids and effect of doping on conductance.

Module III: Electrochemistry and Corrosion
A. Electrochemistry: [16 Periods]
Introduction to Electrochemistry-Conductance (Specific and Equivalent) and units. Types of cells-electrolytic & electrochemical cells (Galvanic Cells)-Electrode potential- cell potential (EMF).Electrochemical series and its applications, Nernst equation its applications and numerical problems. Reference electrodes - Calomel Electrode, Quinhydrone electrode and Glass electrode-determination of pH using glass electrode.
Batteries: Primary (dry cells) and secondary (Lead-Acid cell, Ni-Cd cell) - applications of batteries. Fuel cells: Hydrogen - Oxygen fuel cell and its applications.

**B. Corrosion:**

Causes and effects of corrosion: Theories of corrosion - Chemical & Electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion: Galvanic and Water-line corrosion. Factors affecting rate of corrosion—Nature of metal and Nature of Environment, Corrosion control methods - Cathodic protection (Sacrificial anodic and impressed current cathodic methods). Surface coatings: Methods of metallic coatings - hot dipping (Galvanization), Electroplating (Copper) and Electroless plating (Nickel).

**Module IV: Stereochemistry & NMR Spectroscopy:** [12 Periods]

Introduction to Isomers - classification of isomers - structural (chain, positional & functional) and stereoisomerism-geometrical (cis-trans & E-Z system) - characteristics of geometrical isomerism, optical isomerism (chirality - optical activity, specific rotation, enantiomers and diastereomers) of tartaric acid and lactic acid. Conformational isomerism of n-Butane. Introduction to Spectroscopy, Basic concepts of nuclear magnetic resonance spectroscopy, chemical shift, spin-spin splitting, coupling constant in 2-butene.

**Module V: Reaction mechanism and synthesis of drug molecules** [12 Periods]

Introduction to bond cleavage (homo & hetero cleavage) - reaction intermediates and their stability. Types of organic reactions - Mechanism of substitution (SN₁ & SN₂) - addition (AdE) - elimination (E₁&E₂) reactions with suitable example. Ring opening (Beckmann rearrangement-preparation of Nylon-6), oxidation and reduction (Cannizaro reaction), cyclization (Components of Diels-Alder reaction-Mechanism of Diels-Alder reaction with suitable example) reactions. Synthesis of Paracetamol, Ibuprofen and their applications.

**TEXT BOOKS:**


**REFERENCES:**

E-RESOURCES:
3. http://americanhistory.si.edu/fuelcells/sources.htm (Fuel Cell Information Sources)
5. nptel.ac.in/courses/113108051/ (corrosion & electrochemistry web course)

Course Outcomes:
At the end of the course, students will be able to
1. Understand water treatment, specifically hardness of water and purification of water by various methods.
2. Acquire knowledge on electrochemical cells, fuel cells, batteries and their applications.
3. Analyze microscopic chemistry in terms of atomic and molecular orbital’s splitting and band theory related to conductivity.
4. Acquire basic knowledge on the concepts of stereochemistry.
5. Acquire basic knowledge on chemical reaction mechanisms and that are used in the synthesis of molecules.

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Prerequisite: NIL

Course Objectives: To introduce the concept of electrical circuits and its components. To introduce the characteristics of various electronic devices. To impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.

Module I: DC Circuits [09 Periods]
Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff’s current and voltage laws - Series, parallel, series-parallel, star-to-delta and delta-to-star transformation- analysis of simple circuits with dc excitation. Superposition, Thevenin's and Maximum Power Transfer Theorems with DC excitation.

Module II: AC Circuits [09 Periods]
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel).

Module III: Introduction to Electrical Machines [10 Periods]

Module IV: P-N Junction Diode [10 Periods]
Rectifiers: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier.
Filters: Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

Module V: BJT and Junction Field Effect Transistor (JFET) [10 Periods]
configurations and Input-Output Characteristics, Comparison of CE, CB and CC configurations.

**Junction Field Effect Transistor and MOSFET:** Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET.

**TEXT BOOKS**

**REFERENCES**

**E-RESOURCES**
2. https://www.eeweb.com/passives
3. http://nptel.ac.in/courses/108108076/

**COURSE OUTCOMES:**
At the end of the course, students should be able to
1. Apply basic laws in electrical circuit.
2. Analyze the single phase circuits
3. Comprehend the construction and Operation of DC and AC machines

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4. Know the practical importance of Diode and its characteristics
5. Recognize the construction and operation of BJT and JFET

CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Computer Programming

Course Objectives:
This course will deliver the knowledge in introducing the concepts of various data structures such as linked lists, stacks, queues, trees and graphs along with the applications.

MODULE-I: Performance Analysis and Introduction to data structures  
[10 Periods]
Performance Analysis: Algorithm definition and characteristics, time and space complexity, Asymptotic Notations – Big O, Omega and Theta notations.
Introduction to data structures: Types of data structures: Linear and Non-linear data structures. Recursion definition- Linear and Binary recursion, Design methodology and implementation of recursive algorithms, Recursive algorithms for Towers of Hanoi.

MODULE-II: Linked Lists  
[09 Periods]

MODULE-III: Stacks and Queues  
[10 Periods]
A: Stacks: Basic stack operations, Representation of a stack using arrays and linked lists, Stack Applications - Reversing list, factorial calculation, postfix expression evaluation, infix-to-postfix conversion.
B:Queues: Basic queue operations, Representation of a queue using array and Linked list, Classification and implementation – Circular, Enqueue and Dequeue, Applications of Queues.

MODULE-IV: Trees and Graphs  
[10 Periods]
Trees:Basic concepts of Trees, Binary Tree: Properties, Representation of binary tree using array and linked lists, operations on a binary tree, binary tree traversals, creation of
binary tree from in, pre and post-order traversals, Tree traversals using stack, Threaded binary tree.

**Graphs:** Basic concepts of Graphs, Representation of Graphs using Linked list and Adjacency matrix, Graph algorithms, Graph traversals- (BFS & DFS).

**MODULE-V: Search Trees [09 Periods]**


**TEXT BOOKS:**

**REFERENCE BOOKS:**

**E-RESOURCES:**
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7-3lcmoMAPVUMjliYXX1p5pX8a2mLgDzZ-E41CJ6PVmY4S0MqVbxsFQ
5. http://nptel.ac.in/courses/106102064/1

**Course Outcomes:**
At the end of the course, students will be able to
1. Identify the appropriate data structures and analyze the performance of algorithms.
2. Understand and implement single, double, and circular linked-lists.
3. Implement Stacks and Queues using array and linked-list representations.
4. Develop programs by using non linear data structures such as trees and graphs.
5. Design and Implement applications of advanced data structures.
Prerequisites: NIL

Course Objectives:
The students will be able to understand the manual drawings and getting fundamental knowledge on drafting software.

MODULE I: Introduction, Curves and Projections [10 Periods]
Curves: Conic Sections eccentricity method. Cycloid and Involutes.
Projections: Principles of Orthographic Projections – Conventions – First and Third Angle projections. Projection of points including all four quadrants.

MODULE II: Projection of Lines & Planes [10 Periods]
Projection of Lines: Projection of Lines - Parallel, perpendicular, inclined to one reference plane and inclined to both reference planes. True length and true angle of a line
Projection of Planes: Projection of Planes - inclined to both the planes.

B. Overview of Computer Graphics: Demonstrating knowledge of the theory of CAD software. Menu systems, toolbars [Draw, Modify and Dimension], drawing area annotations. Creation of 2D sketches and 3D models.

MODULE IV: Section of Solids & Development of Surfaces [09 Periods]
Section of Solids: Sectioning of single solids with the cutting plane inclined to one plane and perpendicular to the other - true shape of section.
Development of Surfaces: Development of lateral surfaces of simple and sectioned simple Solids.

MODULE V: Isometric Projections & Transformation of Projections [09 Periods]
Transformation of Projections: Conversion of Isometric Views to Orthographic Views and vice versa – simple objects.

TEXT BOOKS

REFERENCES

E - RESOURCES
1. https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
6. http://nptel.ac.in/courses/112103019/

Course Outcomes
At the end of the course students will be able to
1. Understand the basics of drawings and importance of curves.
2. Draw the projection of points, lines and planes.
3. Draw the projection of solids and section of solids with software.
4. Produce development of surface and isometric projections with software.
5. Convert orthographic views to isometric views and vice-versa by drafting software.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Prerequisite: NIL

Course objectives:
To provide the students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

List of Experiments:
2. Estimation of Total Hardness of water by EDTA Method.
3. Estimation of pH of an acid (Three methods).
4. Estimation of alkalinity of water.
5. Estimation of strength of an acid by Conductometry.
6. Estimation of strength of an acid by Potentiometry.
7. Estimation of Mn^{2+} ion in KMnO₄ by Colorimetry.
8. Determination of viscosity of given liquids by Ostwald’s viscometer.
10. Estimation of iron (II) by dichrometry.
11. Determination of rate constant of hydrolysis of methyl acetate.
12. Preparation of Aspirin.
Course outcomes:

At the end of the course, students will be able to

1. Estimate the hardness of given water samples.
2. Select lubricants for various purposes.
4. Know the strength of an acid present in batteries.
5. Calculate the amount of Mn\(^{+2}\) present in unknown substances/ores using instrumental methods.

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CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Prerequisite: NIL

Course Objectives: To get practical knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET and also analyse the performance of DC Motors, AC Motors and Transformers.

List of Experiments:

1. Verification of Kirchhoff’s Laws.
2. Verification of Maximum Power Transfer Theorem.
4. Brake Test on DC-Shunt Motor. Determination of Performance curves
5. Load Tests on Single Phase Transformer
6. Brake Test on Three Phase Induction Motors. Determination of Performance curves
7. V-I Characteristics of PN junction Diode
8. V-I Characteristics of Zener Diode
10. Input and Output characteristics of BJT with CE configuration
11. Input and Output characteristics of BJT with CB configuration
12. Input and Output Characteristics of JFET.

**Course Outcomes:**
At the end of the course, students will be able to
1. Analyse electrical circuits by applying basic laws
2. Analyse the performance of DC Motor, three phase Induction motor and transformer
3. Understand V-I Characteristics of various diodes
4. Design Different Rectifier Circuits
5. Differentiate the Transistors and their Operations

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Course Objectives:
To develop student’s skill in Computer graphics for communicating the concepts and ideas in Engineering products by using drafting software.

List of Exercises
Any 12 exercises out of fourteen should be done by using drafting software
1. Drawing of basic drawing elements and Regular polygons.
2. Drafting projections of lines- parallel, perpendicular, inclined to one reference plane.
3. Drafting projections of lines - inclined to both reference planes.
4. Drafting projections of lines inclined to both reference planes - obtaining true length.
5. Drafting Projections of planes – Surface inclined to one reference plane.
6. Drafting of regular solids - cube, prism, pyramid, cylinder and cone.
7. Drafting projection of solids inclined to one plane.
8. Drafting projection of section of solids cutting plane inclined to one plane.
9. Drafting development of surface of regular solids - prism
10. Drafting development of surface of regular solids - cylinder, cone
11. Drafting Isometric Projection – Isometric Views- Plane Figures
13. Conversion of Isometric Views to Orthographic Views.

Course Outcomes
At the end of the course students will be able to
1. Draft basic drawings elements.
2. Draw the projection of points, lines and planes on Cartesian coordinates using drafting software.
3. Draw the projection solids on Cartesian coordinates using drafting software.
4. Develop surfaces of regular solids, sectional solids and solids inclined to one axis using drafting software.
5. Convert and develop the isometric views on to orthographic projections using drafting software.
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Prerequisite: NIL

Course Objectives:
This course will deliver the knowledge in introducing the concepts of various data structures such as linked lists, stacks, queues, trees and graphs along with the applications.

Software Requirements: Turbo C

List of Programs:
1. Write a recursive program to solve Towers of Hanoi problem - N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.
2. Write a program to create a single linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count no of elements.
3. Write a program to create a circular linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number of elements.
4. Write a program to create a double linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number of elements.
5. Write a program to implements stack operations using:
   a) Arrays
   b) Linked list
6. Write a program to:
   a) Evaluate Postfix expression.
   b) Convert infix expression into postfix expression
7. Write a program to implements Linear Queue operations using:
   a) Arrays
   b) Linked list
8. Write a program to implements Circular Queue operations using Arrays
9. Write a program to implements Double-ended Queue operations using:
   a) Arrays
   b) Double Linked List
10. Write a recursive program to create a Binary Tree of integers, traverse the tree in
preorder, in order and post order and also print the number of leaf nodes and height of the tree.

11 Write a program to create a Binary Search Tree (BST) and perform insert and search operations on it.

12 Write a program for implementing the following graph traversal algorithms:
   a) Breadth First Search (BFS)
   b) Depth First Search (DFS)

TEXTBOOKS

REFERENCES

Course Outcomes:
At the end of the course, students will be able to
1. Identify the appropriate recursive algorithms and analyze the performance of algorithms.
2. Understand and implement single, double, and circular linked-lists.
3. Implement linear data structures such as Stacks and Queues using array and linked-list representations.

4. Implement non linear data structures such as trees and graphs.
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</table>
Prerequisites: NIL

Course objectives:
To develop physical skills and fitness specific to a particular sport. Provide them the training and coaching towards achieving their group goals. To give the students health and physical fitness to ensure mental and emotional balance. NSS (National Service Scheme) provides ample opportunities for the students to participate in the community service programs. To encourage them to become socially and environmentally sensitive, empathetic and responsible individuals of the nation.

MODULE-I [6 Periods]
Introduction and Basic concepts of NSS: History, Philosophy, aims & Objectives of NSS, Emblem, Motto, Song and Other Components of NSS, NSS Programmes and Activities- Concept of regular activities, Special camping, Day camps. Basis of adoption of villages/ slums & methodology of survey.

MODULE-II [6 Periods]
Volunteerism and Shramdan- needs & Importance of Volunteerism, Motivation and Constraints of Volunteerism, Shramdan as a part of Volunteerism.

MODULE-III [6 Periods]
Introduction of physical education: Importance of physical education, Athletics (Track events and combined events), Basket ball, Throw ball, Foot ball.

MODULE-IV [6 Periods]
Youth and yoga- yoga as a tool for healthy lifestyle, Yoga as a preventive, promotive & curative method. Pranayam and Different Yoga traditions and their impacts.
Various competitions at different levels- Athletics (field events), volleyball, handball, cricket. Indoor games: Table Tennis, Caroms, chess

MODULE-V [6 Periods]
Environmental Issues- Natural Resource Management (Rain water Harvesting, energy conservation etc.). Waste Management, Disaster Management- Role of youth in Disaster Management.
Civil / Self Defense- Aims and objectives of Civil defense and need for self-defense training.
TEXT BOOKS:

REFERENCE BOOKS:

E Resources:
1. http://nptel.ac.in/courses/109106059/11
2. http://nptel.ac.in/courses/109106059/12
3. http://nptel.ac.in/courses/109106059/13
4. http://nptel.ac.in/courses/109106059/14

Course Outcomes:
At the end of the course, students will able to:
1. Understand the concepts of National Service Scheme (NSS) and its activities.
2. Gain the essence of volunteerism and shramdan
3. Understand the rules and procedures of physical education and its events.
4. Learn the basics of yoga and its benefits to the youth in personality development.
5. Gain the knowledge of managing the environmental issues and self-defense activities.
Prerequisites: Basic Probability

Course Objectives:
This course is meant to provide a grounding in Statistics and foundational concepts that can be applied in modeling processes, decision making and would come in handy for the prospective engineers in most branches.

Module - I: Probability [09 Periods]
Introduction to Probability, events, sample space, mutually exclusive events, Exhaustive events, Addition theorem for 2 & n events and their related problems. Dependent and Independent events, conditional probability, multiplication theorem, Baye’s Theorem, Statement of Weak law of large numbers

Module - II: Random Variables and Probability Distributions [10 Periods]

**B: Testing of hypothesis:** Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, and Level of significance. One tailed test, two tailed test.

Large sample tests:
1. Testing of significance for single proportion.
2. Testing of significance for difference of proportion.
3. Testing of significance for single mean.
4. Testing of significance for difference of means.

**Module IV: Small sample tests**

Student t-distribution, its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples, Paired t-test, Snedecor’s F-distribution and it’s properties. Test of equality of two population variances, Chi-square distribution, its properties, Chi-square test of goodness of fit and independence of attributes.

**Module V: Correlation, Regression:**

Correlation & Regression: Correlation, Coefficient of correlation, the rank correlation. Regression, Regression Coefficient, The lines of regression: simple regression.

**TEXT BOOKS:**

**REFERENCES:**

**E RESOURCES:**
4. http://nptel.ac.in/courses/117105085/  (Introduction to theory of probability)
5. http://nptel.ac.in/courses/117105085/9  (Mean and variance of random variables)
6. http://nptel.ac.in/courses/111105041/33  (Testing of hypothesis)
7. http://nptel.ac.in/courses/110106064/5  (Measures of Dispersion)

Course Outcomes:
At the end of the course, students will be able to:
1. The students will understand central tendency and variability for the given data.
2. Students would be able to find the Probability in certain realistic situation.
3. Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variables Involved in the probability models. It is quite useful for all branches of engineering.
4. The student would be able to calculate mean and proportions (large sample) and to make important decisions from few samples which are taken out of unmanageably huge populations.
5. The student would be able to calculate mean and proportions (small sample) and to make important decisions from few samples which are taken out of unmanageably huge populations.

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Prerequisites: NIL

Course Objectives:
This course provides the concepts of mathematical logic demonstrate predicate logic and Binary Relations among different variables, discuss different type of functions and concepts of Algebraic system and its properties. It also evaluates techniques of Combinatorics based on counting methods and analyzes the concepts of Generating functions to solve Recurrence equations.

MODULE I: Mathematical Logic              [10 Periods]
Basic Logics - Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology.
Implications and Quantifiers - Equivalence implication, Normal forms, Quantifiers, Universal quantifiers.

MODULE II: Predicate Logic and Relations            [10 Periods]
Relations - Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Lattices, Hasse diagram.

MODULE III: Functions and Algebraic Structures                              [10 Periods]
A: Functions - Inverse Function, Composition of functions, recursive Functions - Lattice and its Properties.
B: Algebraic structures - Algebraic systems Examples and general properties, Semigroups and monoids, groups, sub-groups, homomorphism, Isomorphism, Lattice as POSET, Boolean algebra.

MODULE IV: Counting Techniques and Theorems           [09 Periods]
Counting Techniques - Basis of counting, Combinations and Permutations with repetitions, Constrained repetitions
Counting Theorems - Binomial Coefficients, Binomial and Multinomial theorems, principles of Inclusion – Exclusion. Pigeon hole principle and its applications.

MODULE V: Generating functions and Recurrence Relation             [09 Periods]
Generating Functions - Generating Functions, Function of Sequences, Calculating Coefficient of generating function.
Recurrence Relations - Recurrence relations, Solving recurrence relation by substitution and Generating functions. Method of Characteristics roots, solution of Non-homogeneous Recurrence Relations.

TEXTBOOKS

REFERENCES

E-RESOURCES
3. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgYe1qwH9xY7xPG734QA9tMJN2ncqS12ZbN7pUSSIWCsGPOZJEokyWJlxQLYsrFyeITA70W9C8Pg
4. http://nptel.ac.in/courses/106106094/

Course Outcomes:
At the end of the course, a student will be able to
1. **Apply** the concepts of connectives and normal forms in real time applications.
2. **Summarize** predicate logic, relations and their operations.
3. **Describe** functions, algebraic systems, groups and Boolean algebra.
4. **Illustrate** practical applications of basic counting principles, permutations, combinations, and the pigeonhole methodology.
5. **Analyze** techniques of generating functions and recurrence relations.

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**Prerequisites:** Basic Hardware Knowledge

**Course Objectives:**
This course used to recognize the basic structure and operation of a digital computer, understand the instruction formats, addressing modes, I/O and interrupts, study the micro programmed control and hierarchical memory system, operations of the arithmetic unit and concepts related to the input-output organization and analyze processor performance improvement using instruction level parallelism and operations in pipeline design.

**MODULE I: Structure of Computers and Micro Operations** [09 Periods]

**MODULE II: Computer Organization and Design, CPU** [09 Periods]
*Computer Organization and Design* - Instruction Codes, Computer Registers, Computer Instructions – Instruction Cycle, Memory Reference instructions, Input-Output and Interrupt.
*Central Processing Unit* - Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, CISC and RISC.

**MODULE III: Micro Programmed Control and Memory Organization** [09 Periods]
A: Micro Programmed Control - Control memory, Address Sequencing, Micro Program Example, Design of Control Unit, Hardwired Control and Micro Programmed Control.

B: Memory Organization - Memory Hierarchy, Main Memory - RAM and ROM Chips, Cache Memory, Performance Considerations, Virtual Memory, Secondary Storage.

MODULE IV: Computer Arithmetic and I/O Organization [12 Periods]


I/O Organization - Peripheral devices, Input-Output interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, and Direct Memory Access.

MODULE V: Pipeline and Vector Processing [09 Periods]

Pipeline - Parallel Processing, Pipeline: Arithmetic, Instruction, and RISC.


TEXT BOOKS


REFERENCES


E-RESOURCES

1. https://books.google.co.in/books?isbn=8131700704
2. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7-Eh9eBOsT1ELoYpKl_g_xngkrluevXOJLs1TbxS8q2icgUs3hL4_KAi5So5FgXcVg
3. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7xAYUzYSiXl4znudls
   oir-e7wQNrNXLxbgGFbkoxy1iN3YbHuFrZIjc_70rWMEwQ
4. http://nptel.ac.in/courses/106106092/

Course Outcomes:
At the end of the course, students will be able to

1. Develop the ability and confidence to use the fundamentals of computer organization as a tool in the engineering of digital systems.
2. **Classify** the impact of instruction set architecture of computer design.
3. **Design** memory organization and control unit operations.
4. **Evaluate** computer arithmetic operations of binary number system and different hardware components associated with the input-output organization.
5. **Ability** to conceptualize instruction level parallelism and pipeline.

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Prerequisites: NIL

Course Objectives:
This course enable the students to interpret main components of operating system and their working, identify the role of Operating System in process scheduling and synchronization, analyze the way of addressing deadlock, understand memory management techniques and I/O systems, describes the way of handling files and security.

**MODULE I: Computer System and Operating System Overview** [10 Periods]

**Basic System and Process Operations** - Overview of Computer System hardware, Operating System Objectives and services, Operating System Structure, System Calls, System Programs.


**MODULE II: Scheduling and Concurrency** [10 Periods]

**CPU Scheduling** - Basic Concepts, Scheduling Criteria, Scheduling Algorithms and evaluation, Threads Overview, Threading issues.

**Concurrency** - Process synchronization, the critical-section problem, Peterson's Solution, synchronization Hardware, semaphores, monitors, classic problems of synchronization.

**MODULE III: Deadlocks** [08 Periods]


**B: Detection and Recovery** - Deadlock avoidance, Deadlock detection, Recovery from Deadlocks.

**MODULE IV: Memory** [12 Periods]

**Memory Management** - Basic concepts, Swapping, Contiguous memory allocation, Paging, Segmentation, Virtual memory, Demand paging, Page-replacement algorithms, Thrashing.

**Secondary Storage Structure and I/O Systems** - Disk structure; Disk scheduling, Disk management, Swap space Management, RAID structure, Stable storage Implementation, Tertiary Storage Structure, I/O hardware, Application I/O interface, Kernel I/O subsystem.
MODULE V: Files                [08 Periods]

File Management - File system-File concepts, Access methods, Directory structure,
File system mounting, File sharing and Protection. Implementing file systems-File system
structure and implementation, Directory implementation, Allocation methods, Free-space
management, Efficiency and performance.


TEXT BOOKS
   Pearson education/PHI

REFERENCES
   Practice”, PHI, 2003

E-RESOURCES
3. https://ndl.iitkgp.ac.in/document/BN1jh1UjGARz_4ciGeVCT3CaRCi4AlvizWVgk
   NQLQcFt_lb03ZmqLHrc1tBe3aA6pjyl3jlrBqPLRxX2VQUvQ
4. http://nptel.ac.in/courses/106108101/

Course Outcomes:
At the end of the course, students will be able to
1. Determine the role of Operating System in a computer.
2. Relate the methods for providing concurrency, communication and synchronization
   among concurrent tasks.
3. Illustrate the schemes used to address the issues of deadlocks.
4. Contrast different memory management techniques.
5. Examine various file management strategies and security issues.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Computer Programming

Course Objectives:
This course will make students able to learn and understand the concepts and features of object oriented programming and the object oriented concept like inheritance and will know how to make use of interfaces and package, to acquire the knowledge in Java’s exception handling mechanism, multithreading, to explore concepts of Applets and event handling mechanism. This course makes students to gain the knowledge in programming using Layout Manager and swings.

MODULE I: OOP concepts & Introduction to C++, Java [09 Periods]

OOP concepts & Introduction to C++ - Introduction to object oriented concepts: Object, class, methods, instance variables; C++ program structure; Standard Libraries; accessing class data members; Overview of Inheritance, Overloading, Polymorphism, Abstraction, Encapsulation and Interfaces.

Introduction to Java - History of JAVA, Java buzzwords, data types, variables, scope and life time of variable, arrays, operators, expressions, control statements, type conversion and type casting, simple Java program.

MODULE II: Basics of JAVA [09 Periods]

Classes and Objects - Concepts of classes, Objects, constructors, methods, this key word, garbage collection overloading methods, constructors parameter passing, recursion. String handling: string, string buffer, string tokenizer.

Inheritance - Base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes.

MODULE III: Interfaces and Exception Handling [12 Periods]

A: Interfaces - Defining an interface, implementing interface, differences between classes and interfaces, extending interfaces. Packages - Defining, creating and accessing a package, importing packages, access control, exploring package-java.io.
B: Exception handling - Concepts of Exception handling, benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of try, catch, throw, throws and finally, built-in exceptions, creating own exception subclasses.

MODULE IV: Multithreading and Event handling [09 Periods]
Multithreading - Differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.
Event handling - Events, Event sources, event classes, event listeners, delegation event model, handling mouse and keyboard events, adapter classes, AWT class hierarchy, user interface components-labels, buttons, canvas, scrollbars, text components, checkbox, checkbox groups, choices, lists.

MODULE V: Layout manager and Swings [09 Periods]
Layout manager - Layout manager types-border, grid, flow, card and grid bag.

TEXT BOOKS

REFERENCES

E-RESOURCES
1. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVlXBW
2. https://ndl.iitkgp.ac.in/result?q={"t":"search","k":"object%20oriented%20programming","s":{"type":"video"},"b":{"filters":[]}}
4. http://www.nptel.ac.in/courses/106103115/36

Course Outcomes:
At the end of the course, students will be able to
1. Differentiate structured programming and object oriented programming and know the concepts of classes, objects, members of a class.
2. Apply object oriented programming features and concepts for solving given problems using inheritance and will know how to organize files in packages and concept of interface.
3. **Capable** of handling run time errors using Exceptional Handling and develop applications for concurrent processing using Thread Concept.

4. **Design** Applets that take user response through various peripheral devices such as mouse and keyboard by event handling mechanism.

5. **Design** interactive applications for use on internet.

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Course Objectives:

- The IT Workshop is a training lab course to get training on PC Hardware, Internet & World Wide Web, and Productivity tools for documentation, Spreadsheet computations, and Presentation.
- To introduce to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers, hardware and software level troubleshooting process.
- To introduce connecting the PC on to the internet from home and workplace and effectively usage of the internet, Usage of web browsers, email, newsgroups and discussion forums. To get knowledge in awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks.
- To introduce the usage of Productivity tools in crafting professional word documents, excel spreadsheets and power point presentations using open office tools and LaTeX.

PC Hardware:
The students should work on working PC to disassemble and assemble to working condition and install operating system like Linux or any other on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.

Problem 1:
Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

Problem 2:
Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

Problem 3:
Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.
Problem 4:  
Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. Internet & World Wide Web.

Problem 5:  
Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate how to access the websites and email.

Problem 6:  
Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Problem 7:  
Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.

Problem 8:  
Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Problem 9:  
Develop home page: Student should learn to develop his/her home page using HTML consisting of his/her photo, name, address and education details as a table and his/her skill set as a list.  
Productivity tools: LaTeX and Word  
Word Orientation : An overview of LaTeX and Microsoft (MS) office / equivalent (FOSS) tool word should be learned: Importance of LaTeX and MS office / equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that should be covered in each, using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

Problem 10:  
Using LaTeX and Word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Problem 11:
Creating project abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Problem 12:**
Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs in word.

**Problem 13:**
Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files, Using help and resources. Creating a Scheduler:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Problem 14:**
Calculating GPA-. Features to be covered:- Cell Referencing, Formulae in spreadsheet – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting.

**Problem 15:**
Creating Power Point: Student should work on basic power point utilities and tools in Latex and Ms Office/equivalent (FOSS) which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting Images, Tables and Charts

**REFERENCES:**
1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. LaTeX Companion – Leslie Lamport, PHI/Pearson.
3. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
5. PC Hardware and A+ Handbook – Kate J. Chase PHI (Microso

| CO- PO Mapping | (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak |

**Course Outcomes:**
At the end of the course, students will be able to
1. Apply knowledge for computer assembling and software installation.
2. Ability how to solve the trouble shooting problems.
3. Apply the tools for preparation of PPT, Documentation and budget sheet etc.
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Course Objectives:
This course enables the students to interpret main components of operating systems and their working, identify the role of Operating System in process scheduling and synchronization, analyze the way of addressing deadlock, understand memory management techniques and I/O systems, describes the way of handling files and security.

Software Requirements: C++/JDK

List of Programs:
1. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF
2. Simulate the following CPU scheduling algorithms
   a) Priority b) Round Robin
3. Simulate the Producer Consumer Problem
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate MVT and MFT techniques.
6. Simulate Paging Technique of memory management
7. Simulate page replacement algorithms a) FIFO b) LRU c) Optimal
8. Simulate the following Disk Scheduling Algorithms
   (a) First Come-First Serve (FCFS)
   (b) Shortest Seek Time First (SSTF)
9. Simulate the following Disk Scheduling Algorithms
   (a) Elevator (SCAN)
   (b) LOOK
10. Simulate all file allocation strategies a) Sequential b) Indexed c) Linked
11. Simulate File Organization Techniques
    a) Single level directory b) Two level
12. Simulate File Organization Techniques
    a) Hierarchical b) DAG

TEXT BOOKS

REFERENCES

Course Outcomes:
At the end of the course, students will be able to
1. Implement various CPU scheduling algorithms, Bankers algorithms used for deadlock avoidance and prevention.
2. Develop disk scheduling algorithms and apply File organization techniques.
3. Simulate file allocation method

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisite: NIL

Course Objectives:
This course will make students able to learn and understand the concepts and features of object oriented programming and the object oriented concept like inheritance and will know how to make use of interfaces and package, to acquire the knowledge in Java’s exception handling mechanism, multithreading, to explore concepts of Applets and event handling mechanism. This course makes students to gain the knowledge in programming using Layout Manager and swings.

Software Requirements: Java

List of Programs:

1. Write Java Programs that implement the following..
a) Constructor  
b) Parameterized constructor  
c) Method overloading  
d) Constructor overloading

2. Write a JAVA program
a) Checks whether a given string is a palindrome or not.  
b) For sorting a given list of names in ascending order.  
c) That reads a line if integers and then displays each integer and the sum of all integers (use string tokenizer class of java.util).

3. Write JAVA programs that uses the following keywords…
a) This  
b) Super  
c) Static  
d) Final

4. Write a JAVA program to implement
a) Method overloading.  
b) Dynamic method dispatch.  
c) Multiple inheritance.
d) Access specifiers.

5. Write a JAVA program that
a) Reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
b) Reads a file and displays the file on the screen, with a line number before each line.
c) Displays the number of characters, lines and words in a test file.

6. Write a JAVA program for handling
a) Checked exceptions.
b) Unchecked exceptions.

7. Write a JAVA program
a) Creates three threads. First thread displays “Good Morning” for every one second, the second thread displays “Hello” for every two seconds, the third thread displays “Welcome” for every three seconds.
b) That correctly implements producer consumer problem using concept of inter thread communication.

8. Develop an Applet that
a) Displays a simple message.
b) Receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named “Compute” is clicked.

9. Write a JAVA program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +,-,*,/ operations. Add a text field to display the result.

10. Write a JAVA program for handling
a) Mouse events.
b) Key events.

11. Write a JAVA program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields num1 and num2. The division of num1 and num2 is displayed in the result field when the divide button is clicked. If num1 or num2 were not an integer, the program would throw number format exception. If num2 were zero, the program would throw an arithmetic exception and display the exception in the message dialogue box.
12. Write a JAVA program that
a) Simulates traffic light. The program lets the user select one of three lights: red, yellow or green. When a radio button is selected, the light is turned on and only one light can be on at a time. No light is on when the program starts.
b) Allows the user to draw lines rectangles and ovals.

TEXT BOOKS

REFERENCES

Course Outcomes:
At the end of the course, students will be able to
1. Build simple java programs using the basic concepts of OOP
2. Develop applications on files, exceptions, threads and applets.
3. Construct GUI based applications.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisites: NIL

Course Objectives:
To develop students' sensibility with regard to issues of gender in contemporary India. To provide a critical perspective on the socialization of men and women. To introduce students to information about some key biological aspects of genders. To expose the students to debates on the politics and economics of work. To help students reflect critically on gender violence. To expose students to more egalitarian interactions between men and women.

MODULE I: UNDERSTANDING GENDER [06 Periods]
Gender: Why Should We Study It? (Towards a World of Equals: Unit -1)
Socialization: Making Women, Making Men (Towards a World of Equals: Unit -2)
Just Relationships: Being Together as Equals (Towards a World of Equals: Unit -2)

MODULE II: GENDER AND BIOLOGY [06 Periods]
Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10)
Two or Many? Struggles with Discrimination.
Additional Reading: Our Bodies, Our Health (Towards a World of Equals: Unit -13)

MODULE III: GENDER AND LABOUR [07 Periods]
A: Housework: the Invisible Labour (Towards a World of Equals: Unit -3)
"My Mother doesn't Work." "Share the Load."
B: Women's Work: Its Politics and Economics (Towards a World of Equals: Unit -7)

MODULE IV: ISSUES OF VIOLENCE [07 Periods]
Sexual Harassment: Say No (Towards a World of Equals: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chdpulum. Domestic Violence: Speaking Out (Towards a World of Equals: Unit -5)
Is Home a Safe Place? When Women Unite (Film" Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about Sexual Violence (Towards a World of Equals: Unit -11)
Blaming the Victim-1 Fought for my Life...." - Further Reading: The Caste Face of Violence.

MODULE V: GENDER STUDIES [07 Periods]
Knowledge: Through the Lens of Gender (Towards a World of Equals: Unit -5)
Point of View. Gender and the Structure of Knowledge. Further Reading: Unacknowledged Women Artists of Telangana.
Whose History? Questions for Historians and Others (Towards a World of Equals: Unit -9)
Reclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.
Essential Reading: All the Units In the Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Mina Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Thant

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field.

TEXT BOOKS
1. Towards a World of Equals: A bilingual Textbook on Gender , A Suneetha -etall

REFERENCES


E-RESOURCES:
1. http://www.actforyouth.net/resources/rf/rf_gender1_1213.cfm (UNDERSTANDING GENDER)

Course Outcomes:
At the end of the course, students will be able to
1. **Develop** a better understanding of important issues related to gender in contemporary India.
2. **Sensitize** about the basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. **Attain** a finer grasp of how gender discrimination works in our society and how to counter it.
4. **Acquire** insight into the gendered division of labour and its relation to politics and economics.
5. **Develop** a sense of appreciation of women in all walks of life.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
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2018-19 Onwards (MR-18)

MALLA REDDY ENGINEERING COLLEGE (Autonomous)

B.Tech. III Semester
Prerequisites: NIL
Course Objectives:
EEA is a think beyond program which will make the student to examine the application of microeconomics theory as applied to the manager’s responsibilities in an organization. To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making. This course should emphasize the quantitative and qualitative applications of economic principle to business analysis.

MODULE I: Business Environment and Managerial Economics  [10 Periods]

MODULE II: Theory of Production and Cost Analysis  [10 Periods]
Cost Analysis - Cost concepts, Opportunity cost, fixed vs. Variable costs, explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEA.

MODULE III: Market structures and Pricing Policies  [09 Periods]
B: Pricing Policies & Methods - Cost plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, PLC based pricing methods.
MODULE IV: Capital and Capital Budgeting [09 Periods]
Capital - Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.
Capital Budgeting - Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

MODULE V: Financial Accounting and Ratios [10 Periods]
Financial Analysis Through Ratios - Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

TEXT BOOKS

REFERENCES

E-RESOURCES
2. http://nptel.ac.in/courses/110105067/
3. http://nptel.ac.in/courses/110107073/
4. http://nptel.ac.in/courses/110101005/
5. http://nptel.ac.in/courses/109104073/
Course Outcomes:
At the end of the course, students will be able to
1. Understand the concepts of managerial economics and their application in evaluating the demand.
2. Evaluate the production function and identifies the least cost combination to control the costs of production.
3. Understand the structures of various market types and their pricing policies.
4. Understand the types of business forms and also be able to evaluate the investments using capital budgeting techniques.
5. Understand the basic concepts of financial accounting and evaluation of company performance using ratio analysis.

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Prerequisites: NIL

Course Objectives:
This course provides students to understand the fundamental concepts of computer networking and communications make use of IEEE standards in the construction of LAN, build the skills of subnetting and supernetting, explain the concepts of protocols of Transport Layer, QoS and Congestion control mechanisms and demonstrate different protocols of Application Layer.

MODULE I: Basics of Networking and Physical layer [10 Periods]
Physical layer - Digital transmission, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

MODULE II: Data link layer [11 Periods]
LAN - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11

MODULE III: Network Layer [09 Periods]
A: Basics of Network Layer - Logical Addressing, Internetworking, Tunneling, Address mapping.

MODULE IV: Transport Layer [09 Periods]
Connection Oriented and Connectionless Protocols - Process to Process Delivery, UDP and TCP protocols, SCTP.
Congestion Control - Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks.

MODULE V: Application layer [09 Periods]
DNS - Domain name space, DNS in internet, Electronic mail
TEXT BOOKS

REFERENCES
1. P.C Gupta, “Data communications and computer Networks”, PHI.

E-RESOURCES
3. https://doi.org/10.1016/0169-7552(89)90019-6
4. http://nptel.ac.in/courses/106105081/

Course Outcomes:
At the end of the course, students will be able to
1. Understand the Layered Architecture of Computer Networks.
2. Conceptualize the protocols of Data Link Layer and can build Local area networks.
3. Apply Subnet and Supernet concepts in the construction of computer network.
4. Summarize the protocols used in Transport Layer, QoS and Congestion control mechanisms.
5. Analyze different protocols of Application Layer and various security risks.

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Prerequisites: NIL

Course Objectives:
This course enables the students to learn the basic concepts and the applications of Data Base Systems and conceptualize and depict a Data Base System using ER diagram, masterin constructing queries using SQL. Using this course student can understand relational database principles, become familiar with the basic issues of transaction processing and concurrency control and Data Base storage structures and access techniques.

MODULE I: Introduction: [10 Periods]

Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

MODULE II: Relational Algebra and Calculus: [9 Periods]
Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases.

MODULE III: Schema Refinement and Normal Forms: [10 Periods]
A:Schema Refinement - Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs,

MODULE IV: Transaction Management and Concurrency Control [10 Periods]


Concurrency Control: Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes.


MODULE V: Storage and Indexing [09 Periods]

Storage - Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing, Index Data Structures, Comparison of File Organizations.


Hash Based Indexing: Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS

REFERENCES:
5. Introduction to Database Systems, C. J. Date, Pearson Education.

E-RESOURCES
COURSE OUTCOMES:
At the end of the course, students will be able to
1. **Identify** the basic elements of a relational database management system and the data models for relevant problems.
2. **Write** SQL Queries by designing entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
3. **Analyze** various functional dependencies and apply normalization for designing a robust data base in the development of application software.
4. **Implement** transactions, concurrency control, recovery and Query optimization techniques.
5. **Compare** various indexing and hashing techniques.

COURSE OUTCOMES:
At the end of the course, students will be able to
1. **Identify** the basic elements of a relational database management system and the data models for relevant problems.
2. **Write** SQL Queries by designing entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
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</table>
Prerequisites: Object Oriented Programming

Course Objectives:
This course enables the students to identify the fundamental concepts for developing web application using PHP language for server side scripting, analyze how data can be transported using XML, develop a web applications with server side programming using java servlets & JSP Servlets and client side scripting with java script and AJAX

MODULE– I [10 Periods]
Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies
File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories

MODULE – II [09 Periods]

MODULE – III [10 Periods]
A: Introduction to Servlets: Common Gateway Interface (CGI), Lifecycle of a Servlet,deploying a servlet,
B: The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

MODULE – IV [09 Periods]
Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

MODULE- V [10 Periods]
Client side Scripting: Introduction to Javascript: Javascript language – declaring variables, scope of variables, functions, event handlers (onclick, onsubmit etc.), Document Object Model, Form validation. Simple AJAX application.

TEXT BOOKS:
1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill

REFERENCES:
2. Java Server Pages – Hans Bergsten, SPD O’Reilly
3. Java Script, D. Flanagan, O’Reilly, SPD.
4. Beginning Web Programming-Jon Duckett WROX.
6. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson

E-RESOURCES
1. https://www.w3schools.com/html/
2. https://www.javatpoint.com/servlet-tutorial
3. https://ndl.iitkgp.ac.in/result?q={%22t%22:%22%22search%22,%22%22k%22:%22web%20technologies%22,%22s%22:[],%22b%22:{%22filters%22:[]}}
4. http://nptel.ac.in/courses/106105084/

Course Outcomes:
At the end of the course, students will be able to
1. Understand the concepts of client side scripting, validating of forms and AJAX programming.
2. Identify the role of server side scripting using PHP programming
3. Create web pages using XML and explore how to parse and use XML Data with java.
4. Design dynamic web application using server side programming with java servlets and JSP
5. Contrast on how to connect and retrieve data through a web page from database using JDBC

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Professional
Elective-I
Prerequisites: Computer Networks

Course Objectives:
This course provides the students to gain knowledge in the cloud computing environment, security architecture and development of cloud services. Students will also examine the collaboration of real time cloud services and analyze the case studies from various cloud development tools.

MODULE I: Introduction to Cloud Computing [8 Periods]

MODULE II: Virtualization [12 Periods]
Virtual Machines and Virtualization of Clusters and Data Centers: Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.

MODULE III: Cloud Computing Architecture over Virtualized Data Centers [8 Periods]
A: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds.

MODULE IV: Cloud Security [8 Periods]

MODULE V: Cloud Programming and Standards [12 Periods]
Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards

TEXT BOOKS

REFERENCES

E-RESOURCES
2. https://www.thesisscientist.com/docs/Study%20Notes/8ad50655-64f5-46d4-bc89-0c02feaf132f
3. http://ndl.iitkgp.ac.in/document/zyMnqgZQXCJME6wgSqrU87VCGcelOw5mZ-5ybmrhKBj79VQPP0_ZQHLqcOopPDoaFWhZybCrPg_joTbBU8ZpGA
5. http://nptel.ac.in/courses/106106129/28

Course Outcomes:
At the end of the course, students will be able to
1. Understand the cloud enabling technologies and the Cloud service models.
2. Choose the levels of virtualization and tools for resource provisioning.
3. Compare the cloud platform architectures of virtualized data centers and Inter-cloud Resource Management.
4. Analyze the principles of Security and Trust management to protect confidentiality of data in the Cloud.

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113
Course Objectives: To understand the neural activities and learning process.

Module I:
Basic Learning Algorithms [09 Periods]

Module II:
Radial Basis Function Networks and Support Vector Machines [09 Periods]
Cover’s Theorem on the Separability of Patterns – Exact Interpolator – Regularization Theory – Generalized Radial Basis Function Networks – Learning in Radial Basis Function Networks – Applications – XOR Problem – Image Classification

Support Vector Machines

Module III:
A: Committee Machines [12 Periods]

B:Neurodynamics Systems

Module IV:

Attractor Neural Networks [09 Periods]
-Continuous BAMs – Adaptive BAMs – Applications


Module V:

Self Organizing Maps [09 Periods]

TEXT BOOKS:

REFERENCES:

Course Outcomes:
At the end of the course, students will be able to
1. Learn basic neural network architecture
2. Learn basic learning algorithms.
3. Understand data pre and post processing
4. Learn training, verification and validation of neural network models
5. Design Engineering application that can learn using neural networks.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
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<td>CO5</td>
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</table>
Prerequisites: NIL
Course Objectives:
This course is to enable the students to understand the fundamental concepts of display devices and output primitives, to demonstrate 2D transformations, viewing and clipping algorithms, explore different representations of 3D objects and illumination models, to understand 3D transformations and viewing, discuss surface detection and animation methods.

MODULE I: Introduction of Graphics [10 Periods]
Output Primitives - Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms, Filled area primitives- Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

MODULE II: Transforming and Viewing [10 Periods]
2-D geometrical transforms - Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.
2-D viewing - Viewing pipeline, viewing coordinate reference frame, window to viewport coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

MODULE III: 3D Objects Representation [10 Periods]
A: Surfaces and Curve - Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves.
B: Models and Methods - Bezier and B-Spline surfaces, Basic illumination models, polygon rendering methods.

MODULE IV: 3D Geometric transformations and Viewing [09 Periods]
3-D Geometric transformations - Translation, rotation, scaling, reflection and Shear transformations, composite transformations.
3-D Viewing - Viewing pipeline, viewing coordinates, view volumes and general
projection transforms, clipping.

MODULE V: Surface detection Methods and Animation [09 Periods]

Visible surface detection methods - Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods.

Computer Animation - Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

TEXT BOOKS

REFERENCES

E-RESOURCES
4. http://ndl.itl.itaac.in/document/yVCWq6u7wgye1qwH9xY7y_TqI7sLJ_1X3zVWNHhVwSwBCdfRRvSTrPP45TFWuzrxWT5ea_k_dP1rirZCeNbWw

Course Outcomes:
At the end of the course, students will be able to
1. Develop simple graphics applications.
2. Apply 2D objects transformations.
3. Use the Concepts of 3D Object representations.
4. Design 3D object transformations and viewing.
5. Build Animation sequences.

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</table>
Prerequisite: NIL

Course Objectives:
This course provides students to understand the fundamental concepts of computer networking and communications make use of IEEE standards in the construction of LAN, build the skills of subnetting and supernetting, explain the concepts of protocols of Transport Layer, QoS and Congestion control mechanisms and demonstrate different protocols of Application Layer.

Software Requirements: Turbo C/JDK

List of Programs:
1. Implement the data link layer farming methods:
   a) CharacterCount
   b) Character stuffing and destuffing.
   c) Bit stuffing and destuffing
2. Implement on a data set of characters the three CRC polynomials: CRC-12, CRC-16 and CRC-32.
3. Implement Parity Check using the following techniques
   a) Single Dimensional Data
   b) Multi Dimensional Data
4. Implement the Even and Odd parity.
5. Implementation of Data Link Protocols
   a) Unrestricted Simplex Protocol
   b) Stop and wait Protocol
   c) Noisy Channel
6. Implementation of Sliding Window Protocols
   a) One bit sliding window protocol
   b) Go Back N sliding window protocol
   c) Selective Repeat sliding window protocol
7. Write a code simulating ARP/RARP protocols
8. Implementation of Routing Protocols
   a) Dijkstra's algorithm
b) Distance Vector routing protocol  
c) Link State routing protocol  

9. Implement the congestion algorithms  
a) Token bucket algorithm  
b) Leaky bucket algorithm  

10. Implement DES algorithm.  
11. Implement RSA algorithm.  
12. Write a program to implement client-server application using TCP  

**TEXT BOOKS**  

**REFERENCES**  
1. P.C. Gupta, “Data communications and computer Networks”, PHI.  

**Course Outcomes:**  
At the end of the course, students will be able to  
1. **Implement** the various protocols.  
2. **Analyze** various Congestion control mechanisms.  
3. **Implement** encryption mechanisms using Symmetric Key and Assymetric Key algorithms.  

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2018-19 Onwards (MR-18) | MALLA REDDY ENGINEERING COLLEGE (Autonomous) | B.Tech. IV Semester
---|---|---
Code: 80515 | DATABASE MANAGEMENT SYSTEMS LAB (Common for CSE and IT) | L T P
Credits: 2 | | - 1 2

Prerequisite: NIL

Course Objectives:
This course enable the students to learn and understand the fundamentals of data models and conceptualize and depict a database system using ER diagram, learn about SQL and relational database design, build the databases using normalization techniques, study the basic issues of transaction processing and concurrency control and to explore the concepts of file organization techniques.

Software Requirements: Mysql 5.6.10

List of Programs:

Roadway Travels: "Roadway Travels" is in business since 1997 with several buses connecting different places in India. Its main office is located in Hyderabad.
The company wants to computerize its operations in the following area
- Reservations and Ticketing
- Cancellations

Reservations & Cancellation:
Reservations are directly handled by booking office. Reservations can be made 30 days in advance and tickets issued to passenger. One passenger/person can book many tickets (to his/her family). Cancellations are also directly handed at the booking office.
In the process of Computerization of Roadway Travels you have to design and develop a Database which consists the data of Buses, Passengers, Tickets and Reservation and cancellation details. You should also develop query’s using SQL to retrieve the data from the database.

The above process involves many steps like 1. Analyzing the problem and identifying the
Entities and Relationships 2. E-R Model 3. Relational Model 4. Normalization 5. Creating the database 6. Querying. Students are supposed to work on these steps week wise and finally create a complete —Database system to Roadway Travels. Examples are given at every experiment for guidance to students.

1: E-R Model
Analyze the problem carefully and come up with the entities in it. Identify what data has to be persisted in the database. This contains the entities, attributes etc. Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any.
Example: **Entities**: 1. BUS 2. Ticket 3. Passenger
**Relationships**: 1. Reservation 2. Cancellation
**PRIMARY KEY ATTRIBUTES**: Ticket ID (Ticket Entity) ; Passport ID (Passenger Entity) ; Bus_NO (Bus Entity)
Apart from the above mentioned entities you can identify more. The above mentioned are few.
**Note**: The student is required to submit a document by writing the Entities and Keys to the lab teacher.

2: Concept design with E-R Model
Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any). Indicate the type of relationships (total / partial). Try to incorporate generalization, aggregation, specialization etc wherever required.

![E-R Diagram]

**Note**: The student is required to submit a document by drawing the E-R Diagram to the lab teacher.
3: Relational Model
Represent all the entities (Strong, Weak) in tabular fashion. Represent relationships in a tabular fashion. There are different ways of representing relationships as tables based on the cardinality. Represent attributes as columns in tables or as tables based on the requirement. Different types of attributes (Composite, Multi-valued, and Derived) have different way of representation.

Example: E-R diagram for bus
Example: The passenger tables look as below. This is an example. You can add more attributes based on your E-R model. This is not a normalized table.

<table>
<thead>
<tr>
<th>Passenger</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Age</td>
<td>Sex</td>
<td>Address</td>
</tr>
<tr>
<td>Passport Id</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The student is required to submit a document by Represent relationships in a tabular fashion to the lab teacher.

4: Normalization
Database normalization is a technique for designing relational database tables to minimize duplication of information and, in so doing, to safeguard the database against certain types of logical or structural problems, namely data anomalies.
For example, when multiple instances of a given piece of information occur in a table, the possibility exists that these instances will not be kept consistent when the data within the table is updated, leading to a loss of data integrity.

<table>
<thead>
<tr>
<th>Passportid</th>
<th>Ticketid</th>
</tr>
</thead>
</table>

A table that is sufficiently normalized is less vulnerable to problems of this kind, because its structure reflects the basic assumptions for when multiple instances of the same information should be represented by a single instance only.

For the above table in the First normalization we can remove the multi valued attribute. Ticket_id and place it in another table along with the primary key of passenger.

First Normal Form: The above table can be divided into two tables as shown below.

<table>
<thead>
<tr>
<th>Passenger</th>
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<th></th>
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</tr>
<tr>
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</tbody>
</table>

You can do the second and third normal forms if required. Anyhow Normalized tables are given at the end.

5: Installation of Mysql and practicing DDL commands
Installation of MySql. In this week you will learn Creating databases, How to create
tables, altering the database, dropping tables and databases If not required. You will also try truncate, rename commands etc.

**Example for creation of a normalized “Passenger” table.**

CREATE TABLE Passenger (Passport_id INTEGER PRIMARY KEY, Name VARCHAR (50) Not NULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) Not NULL);

Similarly create all other tables.

**Note: Detailed creation of tables is given at the end.**

6: Practicing DML commands

DML commands are used to for managing data within schema objects. Some examples:

**SELECT** - retrieve data from the a database
**INSERT** - insert data into a table
**UPDATE** - updates existing data within a table
**DELETE** - deletes all records from a table, the space for the records remain

**Inserting values into Bus table:**
- Insert into Bus values (1234, ‘hyderabad’, ‘tirupathi’);
- Insert into Bus values (2345, ‘hyderabad’, ‘Banglore’);
- Insert into Bus values (23, ‘hyderabad’, ‘Kolkata’);
- Insert into Bus values (45, ‘Tirupathi’, ‘Bangalore’);
- Insert into Bus values (34, ‘hyderabad’, ‘Chennai’);

**Inserting values into Bus table:**
- Insert into Passenger values (1, 45, ‘ramesh’, 45, ‘M’, ‘abc123’);
- Insert into Passenger values (2, 78, ‘geetha’, 36, ‘F’, ‘abc124’);
- Insert into Passenger values (45, 90, ‘ram’, 30, ‘M’, ‘abc12’);
- Insert into Passenger values (67, 89, ‘ravi’, 50, ‘M’, ‘abc14’);
- Insert into Passenger values (56, 22, ‘seetha’, 32, ‘F’, ‘abc55’);

**Few more Examples of DML commands:**
- Select * from Bus; (selects all the attributes and display)
- UPDATE BUS SET Bus No = 1 WHERE BUS NO=2;

7: Querying

In this week you are going to practice queries (along with sub queries) using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.

**Practice the following Queries:**

1. Display unique PNR_no of all passengers.
2. Display all the names of male passengers.
3. Display the ticket numbers and names of all the passengers.
4. Display the source and destination having journey time more than 10 hours.
5. Find the ticket numbers of the passengers whose name start with ‘A’ and ends with ‘H’.
6. Find the names of passengers whose age is between 30 and 45.
7. Display all the passengers names beginning with ‘A’
8. Display the sorted list of passengers names

8 and 9: Querying (continued…)

You are going to practice queries using Aggregate functions (COUNT, SUM, AVG, and
Write a Query to display the Information present in the Passenger and cancellation tables. **Hint: Use UNION Operator.**

Write a Query to display different travelling options available in British Airways. Display the number of days in a week on which the 9W01 bus is available.

Find number of tickets booked for each PNR_no using GROUP BY CLAUSE. **Hint: Use GROUP BY on PNR_No.**

Find the distinct PNR numbers that are present.

Find the number of tickets booked in each class where the number of seats is greater than 1. **Hint: Use GROUP BY, WHERE and HAVING CLAUSES.**

Find the total number of cancelled seats.

**10: Triggers**
In this week you are going to work on Triggers. Creation of insert trigger, delete trigger, update trigger. Practice triggers using the above database.
Eg: CREATE TRIGGER updcheck BEFORE UPDATE ON passenger FOR EACH ROW BEGIN IF NEW.TickentNO > 60 THEN SET New.Tickent no = Ticket no; ELSE SET New.Ticketno = 0; END IF; END;

**11: Procedures**
In this session you are going to learn Creation of stored procedure, Execution of procedure and modification of procedure. Practice procedures using the above database.
Eg: CREATE PROCEDURE myProc () BEGINage>=40; End;

**12: Cursors**
In this week you need to do the following: Declare a cursor that defines a result set. Open the cursor to establish the result set. Fetch the data into local variables as needed from the cursor, one row at a time. Close the cursor when done
CREATE PROCEDURE myProc (in_customer_id INT) BEGIN DECLARE v_id INT;
DECLARE c1 CURSOR FOR SELECT stdId, stdFirstname FROM students WHERE stdId=in_customer_id;
OPEN c1;
FETCH c1 into v_id, v_name; Close c1;
Tables
BUS
Bus No: Varchar: PK (Public key) Source: Varchar Destination: Varchar

Passenger
PPNO: Varchar(15) : PK Name: Varchar(15) Age : int (4) Sex:Char(10) : Male / Female Address: VarChar(20)

Passenger_Tickets
PPNO: Varchar(15): PK Ticker_No: Numeric(9)

Reservation
PNR_No: Numeric(9) : FK Journey_date : datetime(8) No_of_seats : int (8) Address: Varchar (50) Contact_No: Numeric (9) -->should not be less than 9 and should not accept any other character other than Integer Status: Char (2): Yes / No

Cancellation
PNR_No: Numeric(9) : FK Journey_date : datetime(8) No_of_seats : int (8) Address : Varchar (50) Contact_No: Numeric (9) --> Should not be less than 9 and Should not accept any other character other than Integer Status: Char (2) : Yes / No

Ticket
Ticket_No: Numeric (9): PK Journey_date: datetime(8) Age : int (4) Sex:Char(10) : Male / Female Source : Varchar Destination : Varchar Dep_time : Varchar

TEXT BOOKS

REFERENCES
1. M.Mc Laughlin,"Oracle Database 11g PL/SQL Programming", TMH.
2. J.J.Patrick,"SQL Fundamentals", Pearson Education
4. Dr.P.S.Deshpande, "SQL & PL/SQL for Oracle 10g", Black Book, Dream Tech.

Course Outcomes:
At the end of the course, students will be able to
1. Design and implement a database schema for a given problem.
2. Generate queries on a database using SQL commands.
3. Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.
4. Make use of procedures for data accessing and manipulations.
## CO- PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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**Course Objectives:**
To enable the student to program web applications using the following technologies, AJAX, PHP, Tomcat Server, Servlets, JSP

**Software Requirements:** JDK, BDK and Tomcat Server

**Note:**
1. Use LAMP Stack (Linux, Apache, MySQL and PHP) for the Lab Experiments. Though not mandatory, encourage the use of Eclipse platform wherever applicable.
2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

**List of Programs:**

1. Install the following on the local machine
   - Apache Web Server (if not installed)
   - Tomcat Application Server locally
   - Install MySQL (if not installed)
   - Install PHP and configure it to work with Apache web server and MySQL (if not already configured)

2. Write an HTML page including javascript that takes a given set of integer numbers and shows them after sorting in descending order.

3. Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box.

4. Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with white space and lines are separated with new line character.

5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
6. Create an XML document that contains 10 users information. Write a Java program, which takes User Id as input and returns the user details by taking the user information from the XML document using (a) DOM Parser and (b) SAX parser.

Implement the following web applications using (a) PHP, (b) Servlets and (c) JSP:

7. A user validation web application, where the user submits the login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.

8. Modify the above program to use an xml file instead of database.

9. Modify the above program to use AJAX to show the result on the same page below the submit button.

10. A simple calculator web application that takes two numbers and an operator (+, -, /, *, and%) from an HTML page and returns the result page with the operation performed on the operands.

11. Modify the above program such that it stores each query in a database and checks the database first for the result. If the query is already available in the DB, it returns the value that was previously computed (from DB) or it computes the result and returns it after storing the new query and result in DB.

12. A web application takes a name as input and on submit it shows a hello <name> pagewhere <name> is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You <name> message with the duration of usage (hint: Use session to store name and time).

13. A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with “Hello <name>, you are not authorized to visit this site” message, where <name> should be replaced with the entered name. Otherwise it should send “Welcome <name> to this site” message.

14. A web application for implementation:

The user is first served a login page which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions.

If name and password matches, serves a welcome page with user's full name.
If name matches and password doesn't match, then serves “password mismatch” page
If name is not found in the database, serves a registration page, where user’s full name is asked and on submitting the full name, it stores, the login name, password and full name in the database (hint: use session for storing the submitted login name and password)

15. A web application that lists all cookies stored in the browser on clicking “List Cookies” button. Add cookies if necessary.

TEXT BOOKS
1. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill

REFERENCES
1. Java Server Pages – Hans Bergsten, SPD O’Reilly
2. Java Script, D. Flanagan, O’Reilly, SPD.
3. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson.

Course Outcomes:
At the end of the course, students will be able to
1. **Demonstrate** use of LAMP Stack for web applications and Tomcat Server for Servlets and JSPs
2. **Design** simple applications with Technologies like HTML, Javascript, AJAX, PHP,
3. **Utilize** the concepts of Servlets and JSPs and implement dynamic websites and Connect to Database and get results
4. **Use** Parse XML files using Java (DOM and SAX parsers)

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**CO- PO Mapping**
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Course Objectives:
An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences, including geo-systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problem of environment.

MODULE I: Ecosystems: [05 Periods]
Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids, Flow of energy.

MODULE II: Natural resources, Biodiversity and Biotic resources [09 Periods]
Natural Resources - Classification of Resources: Living and Non-Living resources, Renewable and non-renewable RESOURCES. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources – case studies. Energy resources: growing energy needs, introduction to renewable and nonrenewable energy sources.

Biodiversity and Biotic resources - Introduction, Definition, genetic, species and ecosystem diversity. Values of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Threats to Biodiversity (habitat loss, poaching of wildlife, man-wildlife conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation)

MODULE III: Environmental pollution and control [06 Periods]
A: Classification of pollution and pollutants, Causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards.

B: Soil Pollution: Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of
hazardous waste, coastal Pollution due to sewage and marine disposal of industrial effluents. E-waste and its management.

**MODULE IV: Global Environmental Problems and Global effects**  [06 Periods]

**MODULE V: Towards sustainable future:**  [06 Periods]

**TEXT BOOKS**

**REFERENCES**

**E-RESOURCES**
Course Outcomes:
At the end of the course, students will be able to
1. **To enable** the students to realize the importance of ecosystem, its structure, services. To make the students aware of Different natural functions of ecosystem, this helps to sustain the life on the earth.
2. **To use** natural resources more efficiently.
3. **To make** the students aware of the impacts of human actions on the environment, its effects and minimizing measures to mitigate them.
4. **To educate** the students regarding environmental issues and problems at local, national and international level.
5. **To know** more sustainable way of living

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**CO- PO, PSO Mapping**
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Basic Mathematics

Course Objectives:
This course enable the students to define basic properties of formal languages, explain the Regular languages and grammars, inter conversion, Normalizing CFG , describe the context free grammars, minimization of CNF, GNF and PDA , designing Turing Machines and types of Turing Machines, church’s hypothesis counter machines, LBA, P and NP problems and LR grammar.

MODULE I: Fundamentals and Finite Automata [10 Periods]
Review of Mathematical Theory- Sets, functions, logical statements, proofs, relations, languages, Mathematical induction, strong principle, Recursive definitions.
Regular Languages and Finite Automata- Regular expressions, regular languages, applications, Types of grammar: 0, 1, 2 and 3 Automata With output-Moore machine, Mealy machine, Finite automata, memory requirement in a recognizer, definition, union, intersection and complement of regular languages, Non Determinism Finite Automata, Conversion from NFA to FA, Kleene’s Theorem, Minimization of Finite automata.

MODULE II: Context Free Grammar (CFG) and PDA [10 Periods]
Regular Grammar- Definition, Unions Concatenations And Kleen’s* of Context free language Regular grammar, Derivations and Languages, Relationship between derivation and derivation trees, ambiguity.
CFG- Unambiguous CFG and Algebraic Expressions, Bacos Naur Form (BNF), Normal Form – CNF, Deterministic PDA, Equivalence of CFG and PDA, Context free language (CFL), Pumping lemma for CFL.

MODULE III: Turing Machine and Compiler Basics [09 Periods]
Phases, Compiler-Construction Tools. The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzers, Design of a Lexical Analyzer Generator, Optimization of DFA-Based Pattern Matchers

**MODULE IV: Syntax Analysis** [09 Periods]
Introduction - The Role of the parser, Context-Free Grammar, Writing a grammar, Top-down Parsing, Bottom-Up Parsing, Operator-Precedence Parsing, LR Parsers, Using Ambiguous Grammars, Parser Generators.

**Syntax-Directed Translation:** Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, Top Down Translation, Analysis of Syntax-Directed Definitions, Type Systems, Specification of a Simple Type Checker, Equivalence of Type Expressions, Type Conversions.

**MODULE V: Code Optimization and Generation** [10 Periods]

**TEXT BOOKS:**

**REFERENCES:**
2. Deniel I. Cohen, Joh Wiley and Sons, Inc “Introduction to computer theory”.

**E –RESOURCES:**
Course Outcomes:
At the end of the course, students will be able to
1. **Define** the theory of automata types of automata and FA with outputs.
2. **Differentiate** regular languages and applying pumping lemma.
3. **Classify** grammars checking ambiguity able to apply pumping lemma for CFL various types of PDA.
4. **Illustrate** Turing machine concept and in turn the technique applied in computers.
5. **Analyze** P vs NP- Class problems and NP-Hard vs NP-complete problems, LBA, LR Grammar, Counter machines, Decidability of Problems.

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**CO- PO, PSO Mapping**
*(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak*
Course Objectives:
This course aims the students to learn the essentials of mobile apps development, aids in developing simple android applications, identify the essentials of android design, file settings, study about user interface design and develop android APIs.

Module I: Mobile and Information Architecture [10 Periods]
Mobile Information Architecture: Mobile Design, Mobile 2.0, Mobile Web development, Small Computing Device Requirements.

Module II [10 Periods]

Module III [10 Periods]
B: Android File Settings: Android Manifest File and its common settings, Using Intent Filter, Permissions, Managing Application resources in a hierarchy, working with different types of resources.

Module IV [09 Periods]
Android User Interface Design: Essentials User Interface Screen elements, Designing User Interfaces with Layouts.

Module V [09 Periods]
Android APIs-I: Using Common Android APIs Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers.

Android APIs-II: Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TEXT BOOKS:

REFERENCES:
1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd.
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd.

E RESOURCES
1. http://onlinevideolecture.com/ebooks/?subject=Android-Development
3. IEEE Transactions on Mobile Computing
4. International Journal of Interactive Mobile Technologies
5. http://nptel.ac.in/courses/106106147/

Course Outcomes
On successful completion of the course, a student will be able to:
1. Classify different types of Platforms.
2. Appreciate the Mobility landscape.
3. Familiarize with Mobile apps development aspects.
4. Design and develop mobile apps, using Android as development platform, with key focus on user experience design, native data handling and background tasks and notifications.
5. Perform testing, signing, packaging and distribution of mobile apps.

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Prerequisites: NIL

Course Objectives:
This course enables the students to understand the fundamentals of python programming, describe the various operators and control flow statements, analyze various data structures, make use of functions, discuss about MODULEs, packages in python, object oriented concepts, exception handling, illustrate advanced concepts like multithreading, graphics and generate various test cases.

MODULE I: Python Programming-Introduction [09 Periods]
Data Types - Variables, Assignment, Keywords, Input-Output, Indentation-Types - Integers, Strings, Booleans.

MODULE II: Operators and Expressions [09 Periods]
Expressions - Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue.

MODULE III: Data Structures and Functions [10 Periods]
A: Data Structures - Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions.

MODULE IV: MODULEs, Packages and Exception handling [10 Periods]
MODULEs - Creating MODULEs, import statement, from. Import statement; name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor, Method, Inheritance, Overriding Methods, Data hiding.
Error and Exceptions - Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

MODULE V: Library functions and testing [10 Periods]
Testing - Why testing is required?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

TEXT BOOKS

REFERENCES

E–RESOURCES

Course Outcomes
At the end of the course, students will be able to
1. Understand the basics of python programming languages
2. Illustrate simple programs with control structures
3. Apply advanced concepts like data structures and make use of functions.
4. Develop simple applications by using MODULE s, packages and exception handling mechanisms.
5. Demonstrate projects that make use of libraries and generate test cases for the projects.

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**Prerequisites:** Computer Networks

**Course Objectives:**
This course provides the students to understand security concepts, ethics in Network Security, analyze security threats, security services, mechanisms to counter them, comprehend and apply relevant cryptographic techniques, implement security services and mechanisms in the network protocol stack.

**MODULE I: Basic Principles** [09 Periods]
Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography

**MODULE II: Symmetric Encryption** [10 Periods]

**MODULE III: Asymmetric Encryption** [10 Periods]
A: Mathematics of Asymmetric Key Cryptography
Primes, Primality Test, Factorization, Chinese Remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm.

B: Asymmetric Key Cryptography
Difference between Symmetric-Key and Asymmetric key cryptosystems, RSA Cryptosystem, Rabin Cryptosystem, Elgamal Cryptosystem, Elliptic curve Cryptosystems

**MODULE IV: Data Integrity, Digital Signature Schemes and Key Management** [09 Periods]
Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management. Security at the Network Layer: IPSec, System Security

**MODULE V: Security in transport layer and application layer** [10 Periods]
E-mail Security, PGP and S/MIME, Security at the Transport Layer: SSL and TLS, System security.

**TEXT BOOKS:**

**REFERENCES:**

**E -RESOURCES**
3. [http://nptel.ac.in/syllabus/106105031/](http://nptel.ac.in/syllabus/106105031/)

**Course Outcomes:**
At the end of the course, students will be able to
1. **Comprehend** information security awareness and a clear understanding of its importance.
2. **Understand** fundamentals of secret and public cryptography.
3. **Implement** protocols for security services.
4. **Analyze** network security threats and countermeasures.
5. **Deploy** network security designs using available secure solutions (such as PGP, SSL, IPSec, etc).

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Professional Elective
–II
Prerequisites: Database Concepts.
Course Objectives: To understand the distributed database management and real-time application management.

Module I: Introduction of DBMS: [10 Periods]
Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas.

Overview of Relational DBMS
Relational Database Concepts, Normalization, Integrity rules, Relational data languages.

Module II: Distributed DBMS Architecture: [09 Periods]

Module III: Query Processing and Decomposition [09 Periods]
A: Query Processing objectives, Characterization of query processors.
B: Layers of query processing, query decomposition, Localization of distributed data.

Module IV: Query Optimization: [09 Periods]
Query optimization, centralized query optimization, Distributed query optimization algorithms.

Transaction Management: Definition, properties of transaction, types of transactions.

TEXT BOOKS:
2. Stefano Ceri and Willipse Pelagatti: Distributed Databases, McGraw Hill.

REFERENCES:
1. Henry F Korth, A Silberchatz and Sudershan: Database System Concepts, MGH.
2. Raghuramakrishnan and Johhanes Gehrke: Database Management Systems, MGH.
Course Outcomes:
At the end of the course, students will be able to:
1. Understand the role of a distributed database management system in an Enterprise/organization.
2. Design queries of a distributed database management system
3. Apply the principles of query optimization techniques to a database schema.
4. Understand the concept of a database transaction including concurrency control, backup and recovery, and data object locking and protocols.
5. Explain the various types of locking mechanisms used in within database management systems.

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CO- PO Mapping  
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Discrete Mathematics

Course Objectives:
This course enables the students to understand the basic fundamentals of Artificial Intelligence, determine various problem solving strategies, understand the logic concepts, different approaches to represent the knowledge, develop the expert systems in various phases and its applications, apply the fuzzy logic in various problem solving techniques.

MODULE I: Introduction [10 Periods]
Introduction to Artificial Intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends in AI.

MODULE II: Problem Solving [09 Periods]
Problem reduction and game playing: Introduction, problem reduction, game playing, alphabeta pruning, two-player perfect information games.

MODULE III: Logic Concepts and Knowledge Representation [10 Periods]
A: Logic Concepts - Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

MODULE IV: Expert System and Applications [10 Periods]
Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems, blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

MODULE V: Uncertainty Measure [09 Periods]
Probability theory: Introduction, Bayesian belief networks, certainty factor theory, dempster-shafer theory.
Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.
TEXT BOOKS
1. Saroj Kaushik, “Artificial Intelligence”, CENGAGE Learning,
2. Stuart Russel, Peter Norvig, “Artificial intelligence, A modern Approach”, 2nd ed, 
   PEA
4. Patterson,”Introduction to Artificial Intelligence”, PHI

REFERENCES
1. George F Lugar, “Artificial intelligence, structures and Strategies for Complex 
   problem solving”, 5th edition, PEA
2. Ertel, Wolf Gang, “Introduction to Artificial Intelligence”, Springer

E-RESOURCES
1. https://i4iam.files.wordpress.com/2013/08/artificial-intelligence-by-rich-and- 
   knight.pdf
2. https://books.google.co.in/books?id=pVR9W5LEZUwC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
5. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7_M07uyea_7zp_zRG3 
   BvdUVy2Tiab45fvPeNJfynQsAbmBEgDSUqzidwce6xwotJA
6. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwVIxBW-YWRBg_vrHK12- 
   IgOzTVbb5oZ6eQOBjCWDfRvquHJLEOFENjI5AmOqRc9Ar3eJF4CGFrw

Course Outcomes:
At the end of the course, students will be able to
1. Describe the key components of the Artificial Intelligence field.
2. Identify various problem solving strategies.
3. Construct the solution for the problem using various logic and knowledge 
   representation techniques.
4. Interpret the knowledge in various domains using expert systems.
5. Discover the solutions by using the probability theory and fuzzy logic.

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Prerequisites: Computer Graphics

Course Objectives:
This course will enable the students to learn the fundamental concepts of animation, creating flash animation concepts, learn the 3D animation techniques, apply the motion capture software for animation and analyze various color models.

MODULE I: Introduction [09 Periods]

MODULE II: Creating Animation in Flash [10 Periods]
Introduction to Flash Animation – Introduction to Flash – Working with the Timeline and Frame-based Animation - Working with the Time line and Twin based animation - Understanding Layers – Action script.

MODULE III: 3D Animation Effects [10 Periods]
B: Texturing & Lighting of 3D Animation – 3D Camera Tracking –Applications & Software of 3D Animation.

MODULE IV: Motion Capture [09 Periods]
Motion Caption – Formats – Methods – Usages – Expression – Motion Capture Softwares’ – Script Animation Usage – Different Languages of Script Animation among the Software.

MODULE V: Color Model [10 Periods]

TEXT BOOKS
REFERENCES

E-RESOURCES
4. nptel.ac.in/courses/106102063/25

Course Outcomes:
At the end of the course, students will be able to
1. Understand fundamental concepts of animation.
2. Implement animation using flash concepts.
3. Outline the scripting concepts in 3D animation methods.
4. Analyze the different languages of scripting animation techniques.
5. Apply the story developing and color model in 3D animated movies.

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CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Computer Networks and Security

Course Objectives:
This course provides the students to implement the protocols in networking, analyze how communication works and identify design issues in network security and to understand security threats, services and mechanisms.

Software Requirements: Turbo C / JDK

List of Experiments:
1. Write a C program that contains a string (char pointer) with a value ‘Hello world’. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value ‘Hello world’. The program should XOR each character in this string with 0 and displays the result.
3. Write a C program that contains a string (char pointer) with a value ‘Hello world’. The program should AND or and XOR each character in this string with 127 and display the result.
4. Write a Java program to perform encryption and decryption using the following algorithms
   a. Caesar cipher b. Substitution cipher c. Hill Cipher
5. Write a C/JAVA program to implement the DES algorithm logic.
6. Write a C/JAVA program to implement the Blowfish algorithm logic.
7. Write a C/JAVA program to implement the Rijndael algorithm logic.
8. Write the RC4 logic in Java Using Java cryptography; encrypt the text “Hello world” using Blowfish. Create your own key using Java key tool.
9. Write a Java program to implement RSA algorithm.
10. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
11. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
12. Calculate the message digest of a text using the MD5 algorithm in JAVA.

TEXT BOOKS:
REFERENCES:
1. P.C .Gupta, “Data communications and computer Networks”, PHI.

Course Outcomes:
At the end of the course, students will be able to
1. Deploy concepts like stuffing and parity check.
2. Implement various protocols like stop and wait protocol, selective repeat sliding window protocol.
3. Develop encryption algorithms for real time applications.

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### Prerequisites: NIL

### Course Objectives:
The main objective of this course makes the students to know the components and structure of mobile application development frameworks for Android and windows OS based mobiles, deploy various mobile application development frameworks, analyze important design concepts and issues of development of mobile applications, understand the capabilities and limitations of mobile devices.

### List of Experiments:
1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.
12. Develop an application using all components of android and database.

### TEXT BOOKS

### REFERENCES
1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd.
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd.
Course Outcomes:
On successful completion of the course, a student will be able to:
1. **Design** and Implement various mobile applications using emulators.
2. **Develop** native android applications using android SDK
3. **Deploy** applications to hand-held devices.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: NIL

Course Objectives:
This course enables the students to develop various applications using python.

Software Requirements: python 2.7

List of Programs:
1. a) Run instructions in Interactive interpreter and a Python Script.
   b) Write a program to purposefully raise Indentation Error and correct it.
2. a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).
   b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
3. a) Write a Program for checking whether the given number is a even number or not.
   b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10.
   c) Write a program using a for loop that loops over a sequence. What is sequence?
   d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
4. a) Find the sum of all the primes below two million.
    Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
    b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.
5. a) Write a program to count the numbers of characters in the given string and store them in a dictionary data structure
   b) Write a program to use split and join methods in the given string and trace a birthday with a dictionary data structure.
6. a) Write a program to combine two lists into a dictionary.
   b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
7. a) Write a program to print each line of a file in reverse order.
    b) Write a program to compute the number of characters, words and lines in a file.
8. a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius. If (distance between two balls centers) \( \leq \) (sum of their radii) then (they are colliding).
b) Find mean, median, mode for the given set of numbers in a list.

9. a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

10. a) Write a function cumulative_product to compute cumulative product of a list of numbers.
   b) Write a function reverse to reverse a list. Without using the reverse function.

11. a) Write a program that defines and print a matrix.
   b) Write a program to perform addition of two square matrices.
   c) Write a program to perform multiplication of two square matrices.

12. a) Install packages requests, flask and explore them.
   b) Write a script that imports requests and fetch content from the page.
   c) Write a simple script that serves a simple HTTPResponse and a simple HTML Page.
   d) Write a program to implement class for ATM and include functions required for it.

TEXT BOOKS:

REFERENCES

Course Outcomes:
At the end of the course, students will be able to
1. Develop simple applications using python.
2. Make use of functions in python scripts.
3. Deploy applications and packages necessary for applications.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Course Objectives: To understand the importance of Indian Constitution, Administration, concept and development of Human Rights, Election Commission.

MODULE-I [06 Periods]
Introduction to Indian Constitution: Constitution’ meaning of the term, Indian Constitution- Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

MODULE-II [07 Periods]
Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions; State Government and its Administration Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

MODULE-III [06 Periods]
A. Local Administration District’s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,
B. Pachayati Raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

MODULE-IV [07 Periods]

MODULE-V [06 Periods]
Election Commission: Election Commission- Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women
REFERENCES:
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics, Hans
7. J. Raj, Indian Government and Politics
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press

E-RESOURCES:
1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course outcome:
At the end of the course, the student will be able to:
1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisites: NIL

Course Objectives:
This course provides the students a broad introduction to python programming, machine learning, discuss about various learning algorithms like decision tree learning, Bayesian learning, computational learning, instance based learning, combined inductive and analytical learning methods, analyze genetic algorithms and various learning set of rules.

Module I: Python programming -Machine Learning (ML) [10 Periods]

Introduction to Python:
Python, expression, variables, assignment statements, functions, built in function, strings, modules, lists, making choice( Boolean, if, storing conditional statements), repetition(loops, while, counted loops, user input loops, control loops , style notes), File processing( one record per line, records with multiple fields, positional data, multiline records, looking ahead, writing files), sets and dictionaries( sets, dictionaries, inverting a dictionary), Algorithms with suitable example. Construction of functions, methods, Graphical user interfaces, databases and applications.

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in ML

Module II: Decision Tree Learning and ANN [09 Periods]

Decision Tree learning - Introduction, Decision Tree representation, Appropriate Problems, Decision Tree learning algorithm, Hypothesis Space Search, Inductive bias, Issues.
Artificial Neural Networks - Introduction, Neural network representation, Problems for Neural Network Learning, Perceptions, Multilayer networks and Back Propagation algorithm, Remarks on back propagation algorithm, Evaluation Hypotheses, Motivation, Estimation hypothesis accuracy, Sampling theory, General approach for deriving confidence intervals, Difference in error of two hypotheses,
Module III: Bayesian learning and Instance based Learning         [10 Periods]
A: Bayesian learning - Introduction and concept learning, Maximum Likelihood and Least Squared Error Hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle.

Module IV: Rules and Analytical Learning            [09 Periods]
Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

Module V: Learning Techniques              [10 Periods]
Combining Inductive and Analytical Learning - Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to initialize Hypothesis, Using Prior Knowledge to alter Search Objective, Using Prior Knowledge to Augment Search Operators.
Reinforcement Learning - Introduction, Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

TEXT BOOKS

REFERENCES

E-RESOURCES
2. https://goo.gl/FKioSh
5. http://nptel.ac.in/courses/106106139/
6. http://nptel.ac.in/courses/106105152/

Course Outcomes:
At the end of the course, student will be able to
1. **Formulate** machine learning problems corresponding to different applications.
2. **Understand** a range of machine learning algorithms like decision trees, and ANN.
3. **Apply** Machine Learning algorithms, Bayesian and Instance based Learning techniques.
4. **Use** of machine learning algorithms to solve problems using rules, and analytical learning techniques
5. **Illustrate** the Combining Inductive and Analytical Learning and applications of Reinforcement Learning

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**CO- PO Mapping**
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisite: NIL

Course Objectives:
Student will be able to learn fundamental aspects of Software Engineering and analyze various process models. To identify various types of requirements and the process for Requirements Engineering. To make use of various System Models to conceptualize and construct a system. To demonstrate different testing tactics and define metrics for software measurement. To classify and mitigate the Software Risks and learn to achieve quality standards.

Module I: Introduction to Software Engineering [09 Periods]
Process Models: The water fall model, Incremental process models, evolutionary process models, and the unified process.

Module II: Requirements of Software Engineering [09 Periods]
Software Requirements: Functional and non functional requirements, User requirements, System requirements, Interface specification, The software requirements document.
Requirements Engineering Process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management

Module III: Phases of Software Engineering [09 Periods]
A: System Models: Context models, Behavioral models, Data models, Object models, Structured methods
B: Design Engineering: Design process and design quality, design concepts the design model
Creating an architectural design: Software architecture, data design, architectural styles and patterns, architectural design

Module IV: Test Strategies [09 Periods]

Product Metrics: Software Quality, Metrics for analysis model, Metrics for design model, Metrics for source code, Metrics for testing, Metrics for maintenance

Metrics for process and products: Software measurement, Metrics for software quality

Module V: Risk Management [09Periods]

Quality Management: Quality concepts, Software quality assurance, Software reviews, Formal technical reviews, Statistical Software Quality Assurance, Software Reliability, ISO 9000 Quality standards

TEXT BOOKS:

REFERENCES:

E RESOURCES:
1. https://books.google.co.in/books?id=bL7QZHtWvaUC&printsec=frontcover&dq=software+engineering+by+roger+pressman+vth+edition+free+download&hl=en&sa=X&ved=0ahUKEwiLkOz-pL_TAhWIuI8KHZSxD2cQ6AEIMDAC#v=onepage&q=software%20engineering%20by%20roger%20pressman%20vth%20edition%20free%20download&f=false
2. https://books.google.co.in/books?id=PqsWaBkFh1wC&printsec=frontcover&dq=software+engineering+by+ian+sommerville+FREE+download&hl=en&sa=X&ved=0ahUKEwjjv5fhpb_TAhUHOo8KHY5OAC4Q6AEIKjAB#v=onepage&q=software%20engineering%20by%20ian%20sommerville%20FREE%20download&f=false
Course Outcomes:
At the end of the course, student will be able to
1. **Analyze** the customer business requirements and choose the appropriate Process model for the given project
2. **Elicit** functional and non-functional requirements using rigorous engineering methodology
3. **Conceptualize** and achieve requirements defined for the system using Architectural styles and Design patterns
4. **Design** test cases and define metrics for standardization.
5. **Assess**, mitigate and monitor the risks and assuring quality standards

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Professional
Elective –III
Prerequisites: Computer Networks, DBMS and Operating Systems

Course Objectives:
Student will be able to learn fundamental aspects of Distributed systems and analyze basics of Architectural and Fundamental Models. To identify various types of requirements and the process for Distributed objects. To make use of various os layers to conceptualize and construct a system, to demonstrate different file systems tactics and define Events and time ordering in distributed transactions.

Module I: Basic Concepts [09 Periods]

Module II: Processes and Distributed Objects [09 Periods]

Module III: Operating System Issues I [10 Periods]

Module IV: Operating System Issues II [10 Periods]

Module V: Distributed Transaction Processing [09 Periods]
Transactions – Nested Transactions – Locks – Optimistic Concurrency Control – Timestamp Ordering – Comparison – Flat and Nested Distributed Transactions – Atomic

TEXT BOOKS:

REFERENCES:

E- REFERENCES

Course Outcomes:
At the end of the course, student will be able to
2. Learns inter process communication and distributed objects.
3. Design Cryptographic Algorithms and security issues for distributed systems.
4. Assess distributed file systems.
5. Ordering of events: using logical and physical clocks.

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Prerequisites: NIL

Course Objectives:
To comprehend the relation between human visual system and machine perception and processing of digital images. To provide a detailed approach towards image processing applications like enhancement, segmentation, and compression.

MODULE I: Digital Image Fundamentals & Image Transforms [09 Periods]

MODULE II: Image Enhancement (Spatial Domain) [11 Periods]
Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non-Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

MODULE III: Image Restoration [09 Periods]
Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

MODULE IV: Image Segmentation [10 Periods]
Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation. Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

MODULE V: Image Compression [09 Periods]

**TEXT BOOKS:**

**REFERENCES:**

**E-RESOURCES:**

**Course Outcomes:**
At the end of the course, students will be able to
1. **Exploration** of the limitations of the computational methods on digital images.
2. **Expected** to implement the spatial and frequency domain image transforms on enhancement
3. **Explain** the different image restoration of images.
4. **Elaborate** understanding on image enhancement techniques.
5. **Analyze** and define the need for compression and evaluate the basic compression algorithms

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**CO- PO Mapping**
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
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Prerequisites: Computer Networks

Course Objectives:
This course enables the students to understand the main concepts of Security services and Attacks, categorize various Conventional Encryption Algorithms, compare various algorithms and fundamental ideas of public-key cryptography, illustrate various E-Mail privacy techniques and infer web security and intrusion detection systems.

MODULE I: Introduction - Security Attacks and Mechanisms [10 Periods]
Security Attacks - Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability)
Security Mechanisms - A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking and man-in-the-middle attacks.

MODULE II: Encryption [09 Periods]
Key Distribution - key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

MODULE III: Cryptographic Techniques [10 Periods]
A: Cryptographic Techniques - Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates.
B: Key Management - Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

MODULE IV: Email Privacy [09 Periods]
Email Privacy - Pretty Good Privacy (PGP) Characteristics of PGP, Cryptographic Keys and Key rings, PGP Message Generation.
S/MIME - S/MIME, MIME Types and Subtypes, Cryptographic algorithms in S/MIME.
MODULE V: IP & Web Security              [10 Periods]

TEXT BOOKS

REFERENCES

E-RESOURCES
2. https://docs.google.com/file/d/0B5F6yMKYDUbrYXE4XiZCUHpLNNc/edit
6. http://ndl.iitkgp.ac.in/document/xttk-4kfhuWvIXBW-YWRO7kjasUj1lin1v_dK KbzKa2DVOR95P_mMw88pOqinTDauGH9wz6GFBPlmIE6A

Course Outcomes:
At the end of the course, students will be able to
1. Analyze various security service mechanisms.
2. Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to various attacks.
3. Apply cryptographic techniques in real time applications
4. Formulate web security services and mechanisms.
5. Distinguish SSL, TLS and its applications.

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173
Professional Elective –IV
Prerequisites: Databases, programming fundamentals.

Course Objectives:
This course enables the students to learn and understand Big data, data analytics, R language, developing map reduce programs, discuss about concepts of big data, make use of Hadoop concepts for designing applications, develop applications using Hadoop I/O and analyze big data using programming tools such as Pig and Hive.

MODULE I: Big data overview, data analytics, and R Language [09 Periods]
Big Data Overview: Data Structures, Analyst Perspective on Data Repositories, State of the Practice in Analytics, BI Versus Data Science, Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics. Data Analytics Lifecycle, Model Building and Basic Data Analytic Methods Using R Data Analytics Lifecycle Overview, Key Roles for a Successful Analytics Project, Background and Overview of Data Analytics Lifecycle - Discovery, Data Preparation, Learning the Business Domain, Model Planning, Model building, Communicate Results, Operationalize and case study example Global Innovation Network and Analysis (GINA)

MODULE II: Working with Big Data [09 Periods]
Configuring of Hadoop Cluster - Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

MODULE III: Hadoop API and Map Reduce Programs [09 Periods]
A: Hadoop API - Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New)
B: MapReduce Programs with classes - Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner.

MODULE IV: Hadoop I/O and Implementation [09 Periods]

**Implementation** - Implementing a Custom Writable: Implementing a RawComparator for speed, Custom comparators.

**MODULE V: PIG and HIVE HADOOP TOOL**  
[12 Periods]

**PIG - HADOOP TOOL** - Hadoop Programming Made Easier - Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.


**TEXT BOOKS**

**REFERENCES**
1. Alex Holmes, “Hadoop in Practice”, MANNING Publ.

**E-RESOURCES**

**Course Outcomes:**
At the end of the course, students will be able to
1. Develop simple applications using R language
2. Analyze file systems such as GFS and HDFS.
3. Design applications by applying Map reduce concepts.
4. Build up programs by making use of I/O.
5. Explore and inspect the big data using programming tools like Pig and Hive.

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Prerequisite: NIL

Course Objectives:
The student will be able to understand the Unified Modeling Language Principles and learns fundamental process pattern for object-oriented analysis and design.

Module I: UML
Introduction to UML [09 Periods]
Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle.

Module II: Behavioral and structural Modeling [09 Periods]
Basic Behavioral Modeling-I: Use cases, Use case Diagrams, Activity Diagrams.
Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

Module III: Behavioral Model II
A: Advanced Structural Modeling [12 Periods]
Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.
B: Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.
Basic Behavioral Modeling-II: Interactions, Interaction diagrams

Module IV: Advanced Behavioral Modeling
Advanced Behavioral Modeling [09 Periods]
Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

Module V: Architecture Modeling
Architectural Modeling [09 Periods]
Component, Deployment, Component diagrams and Deployment diagrams.
Case Study: The Unified Library application.
TEXT BOOKS:
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

REFERENCES:

Course Outcome:
At the end of the course, students will be able to
1. Analyze the requirements through Use-Case View
2. Identify all structural and behavioral concepts of the entire system
3. Develop a model using UML concepts by different types of diagrams like Use case diagram, Class Diagram, Sequence Diagram etc.
4. Design event process and state chart diagrams for the models
5. Build an application with object oriented analysis and design concepts.

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Course Objectives:
This course helps to explore on the advanced concepts and state-of-the-art developments in computer architecture: memory systems, pipelining, simultaneous multithreading, runtime optimization, array processing, parallel processing, multiprocessing, abstract analytic models, power-aware computing, embedded computing, relationship between computer design and application requirements, cost/performance tradeoffs, and many example computers of interesting and unusual features.

MODULE I:
Fundamentals of Computer design- Technology trends- cost price and their trends-measuring and reporting performance - quantitative principles of computer design

MODULE II:
Instruction set principles and examples- Classifying instruction set architecture - memory addressing- type and size of operands- operations in the instruction set-instructions for control flow- encoding an instruction set.

MODULE III:
Instruction level parallelism (ILP)and its dynamic exploitation – Concepts and challenges-overcoming data hazards- reducing branch costs with dynamic hardware prediction – high performance instruction delivery- hardware based speculation ILP software approach- compiler techniques- static branch protection - VLIW approach - H.W support for more ILP at compile time.

MODULE IV:
Memory hierarchy design- Cache performance- reducing cache misses penalty and miss rate – virtual memory. Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading

MODULE V:
Storage systems - Types – Buses - RAID- errors and failures - designing an I/O system in five easypieces. Inter connection networks and clusters - interconnection network media – practical issues in interconnecting networks – clusters- designing a cluster
TEXT BOOKS:

REFERENCE BOOKS:

Course Outcomes:
At the end of the course, students will be able to
1. Understand and apply concept and principle of cache memory and virtual memory to high-performance computer architecture.
2. Understand pipelining and its speed advantage & design pipelined logic.
3. Proficient in fault-tolerant design techniques and examine various methods of error detection and correction such as TMR and Hamming Codes.
4. Identify tradeoffs between complex instruction set computers (CISC) and reduced instruction set computers (RISC).
5. Analyze and perform tradeoffs between the cost, performance, and reliability of alternative computer architectures.

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Prerequisite: NIL

Course Objectives:
The learners need to be aware of the characteristics of technical communication in their workplaces; as a result, they are exposed to different channels of technical communication. Hence the acquired skills make the learners effective communicators using persuasive language. Besides the above said, one of the major objectives is to maintain objectivity in writing documents and to produce professional quality documents using different components of the language.

Introduction: Effective Communication binds any progressive organization. At the B Tech third year level, the Technical Communication and Presentation skills laboratory is introduced to help students succeed in attaining a challenging and a professional career. Each unit aims to reinforce learning and helps the learners perform well before and after they enter the world of work. The course is designed to be practical, stimulating and challenging providing opportunities to the learners to go beyond the classrooms and get empowered in Technical Communication skills. The course enables the students understand the employers’ expectations that are varied from company to company while giving them insight into the acceptable norms of attitude, behavior and etiquette. The course also focuses on the presentation skills of the learners

Methodology: Facilitator’s role: Since classroom learning augments thinking process, helping them to develop written, spoken and non verbal communication, the facilitator / Faculty would briefly discuss the topics with the students and later on guide them while the students involved in activities, writing work and while making presentations. The facilitator is required to design a lot of practical/industry oriented project works for the students
*Students are required to participate, perform, write and submit the work in the form of written documents or Power Point Presentations to hone their spoken written and non verbal communication skills. Students are to take up field work and submit the project work.

MODULE I: Oral Presentation
Mechanics of Presentations – Methodology of Presentation, Importance of Non-verbal communication during presentations– Nuances of Presentation.
*This particular MODULE is for internal evaluation purpose(s).
MODULE II: E - Correspondence and Email etiquette
Common web mail services, yahoo, gmail etc, fields to pay attention- To:, Cc:, Bcc:, Reply All, Subject, Salutation, Body, Signature, Font, Caps Lock, Highlight, The ‘KISS’ strategy (Keep It Simple and Short,) Points to remember while signing off, Introduction to Technical Vocabulary.
• This MODULE is purely for internal assessment/evaluation

MODULE III: Group Discussion
Initiators- Contributor-Informer-Team Leader-Motivator-Creative Contributor , Importance of , Non verbal communication -eye contact, voice characters, posture, gestures, do’s and don'ts, Role play and Simulation- Learners assuming the roles of characters and participating in Group discussion, analysis, or prediction with strictly defined goals.

MODULE IV: Interview Skills & Office Etiquette
Preparing for the interview, types of interviews, interview session, importance of non verbal communication during the interview, do’s and don'ts of interview, follow up and thanking letter. FAQ's. Formal Conversation, office attire- do’s and don’ts, greetings and meetings, speaking to seniors and handshakes, offering and taking visiting cards.

MODULE V: Job Hunt Process
SWOT analysis, correspondence and browsing the internet to search for a suitable job(s), job application-cover letter drafting, drafting a winning resume’, types of resume’s - electronic, video and printed resume’s
• Instruction: Students are required to prepare their video resume which will be assessed by the faculty member.

REFERENCES
4. Leslie. T. Giblin: Skill with people Publication details not known
E-RESOURCES

Course Outcomes:
At the end of the course, students will be able to
2. Draft appropriate Resume in accordance with the context.
3. Participate and present their view and ideas logically and confidently.
4. Understand the importance of communication in various settings.
5. Utilize the technology for career advancement.
Prerequisites: Computer Programming

Course objectives:
This course provides the students a broad introduction to python programming, machine learning, discuss about various learning algorithms like decision tree learning, Bayesian learning, computational learning, instance based learning, combined inductive and analytical learning methods, analyze genetic algorithms and various learning set of rules.

List of Programs
1. Install the python software/Anaconda- python and install useful package for machine learning load the dataset(sample), understand, and visualize the data
2. Implement simple linear regression
3. Implement multivariate linear regression.
4. Implement simple logistic regression and multivariate logistic regression.
5. Implement decision trees.
6. Implement any 3 classification algorithms.
7. Implement random forests algorithm
8. Implement K-means, KNN algorithms
9. Implement SVM on any applicable datasets.
10. Implement neural networks
11. Implement PCA.
12. Implement anomaly detection and recommendation.

REFERENCES

Course Outcomes:
At the end of the course, students will be able to:
1. Apply Machine learning approaches for a given problem.
2. Analyze and identify the need for machine learning techniques for a particular domain.
3. Develop the real time applications and predict its outcomes using machine learning algorithms.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisite: NIL
Course Objectives: To understand the software engineering methodologies involved in the phases for project development. To gain knowledge about open source tools used for implementing software engineering methods. To exercise developing product-startups implementing software engineering methods. Open source Tools: StarUML / UMLGraph / Topcased.

Prepare the following documents and develop the software project startup, prototype model, using software engineering methodology for at least two real time scenarios or for the sample experiments.

- Problem Analysis and Project Planning: Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.
- Software Requirement Analysis: Describe the individual Phases/modules of the project and Identify deliverables. Identify functional and non-functional requirements.
- Data Modeling: Use work products – data dictionary.
- Software Designing: Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.
- Prototype model: Develop the prototype of the product.

The SRS and prototype model should be submitted for end semester examination.

List of Sample Experiments:
Course management system (CMS)
A course management system (CMS) is a collection of software tools providing an online environment for course interactions. A CMS typically includes a variety of online tools and environments, such as:

- An area for faculty posting of class materials such as course syllabus and handouts
- An area for student posting of papers and other assignments
- A grade book where faculty can record grades and each student can view his or her grades
- An integrated email tool allowing participants to send announcement email messages to the entire class or to a subset of the entire class
- A chat tool allowing synchronous communication among class participants
- A threaded discussion board allowing asynchronous communication among participants
In addition, a CMS is typically integrated with other databases in the university so that students enrolled in a particular course are automatically registered in the CMS as participants in that course.

The Course Management System (CMS) is a web application for department personnel, Academic Senate, and Registrar staff to view, enter, and manage course information formerly submitted via paper. Departments can use CMS to create new course proposals, submit changes for existing courses, and track the progress of proposals as they move through the stages of online approval.

**Easy Leave**

This project is aimed at developing a web based Leave Management Tool, which is of importance to either an organization or a college. The Easy Leave is an Intranet based application that can be accessed throughout the organization or a specified group/Dept. This system can be used to automate the workflow of leave applications and their approvals. The periodic crediting of leave is also automated. There are features like notifications, cancellation of leave, automatic approval of leave, report generators etc in this Tool.

**Functional components of the project:**

There are registered people in the system. Some are approvers. An approver can also be a requestor. In an organization, the hierarchy could be Engineers/Managers/Business Managers/Managing Director etc. In a college, it could be Lecturer/Professor/Head of the Department/Dean/Principal etc.

**Following is a list of functionalities of the system: A person should be able to**

- login to the system through the first page of the application
- change the password after logging into the system
- see his/her eligibility details (like how many days of leave he/she is eligible for etc)
- query the leave balance
- see his/her leave history since the time he/she joined the company/college
- apply for leave, specifying the from and to dates, reason for taking leave, address for communication while on leave and his/her superior’s email id
- see his/her current leave applications and the leave applications that are submitted to him/her for approval or cancellation
- approve/reject the leave applications that are submitted to him/her
- withdraw his/her leave application (which has not been approved yet)
- Cancel his/her leave (which has been already approved). This will need to be approved by his/her Superior
- get help about the leave system on how to use the different features of the system
- As soon as a leave application/cancellation request/withdrawal/approval/rejection/password-change is made by the person, an automatic email should be sent to the person and his superior giving details about the action
- The number of days of leave (as per the assumed leave policy) should be automatically credited to everybody and a notification regarding the same be sent to them automatically.
- An automatic leave-approval facility for leave applications which are older than 2 weeks should be there. Notification about the automatic leave approval should be sent to the person as well as his superior.

**E-Bidding**

Auctions are among the latest economic institutions in place. They have been used since antiquity to sell a wide variety of goods, and their basic form has remained unchanged. In this dissertation, we explore the efficiency of common auctions when values are interdependent; the value to a particular bidder may depend on information available only to others—and asymmetric. In this setting, it is well known that sealed-bid auctions do not achieve efficient allocations in general since they do not allow the information held by different bidders to be shared.

Typically, in an auction, say of the kind used to sell art, the auctioneer sets a relatively low initial price. This price is then increased until only one bidder is willing to buy the object, and the exact manner in which this is done varies. In my model a bidder who drops out at some price can “reenter” at a higher price. With the invention of E-commerce technologies over the Internet the opportunity to bid from the comfort of one’s own home has seen a change like never seen before. Within the span of a few short years, what may have began as an experimental idea has grown to an immensely popular hobby, and in some cases, a means of livelihood, the Auction Patrol gathers tremendous response every day, all day. With the point and click of the mouse, one may bid on an item they may need or just want, and in moments they find that either they are the top bidder or someone else wants it more, and you’re outbid! The excitement of an auction all from the comfort of home is a completely different experience.

Society cannot seem to escape the criminal element in the physical world, and so it is the same with Auction Patrols. This is one area where in a question can be raised as to How safe Auction Patrols.

**Proposed system**

- To generate the quick reports
- To make accuracy and efficient calculations
- To provide proper information briefly
- To provide data security
- To provide huge maintenance of records
  - Flexibility of transactions can be completed in time

**Electronic Cash counter**

This project is mainly developed for the Account Division of a Banking sector to provide better interface of the entire banking transactions. This system is aimed to give a better outlook to the user interfaces and to implement all the banking transactions like:
• Supply of Account Information
• New Account Creations
• Deposits
• Withdraws
• Cheque book issues
• Stop payments
• Transfer of accounts
• Report Generations.

Proposed System:
The development of the new system contains the following activities, which try to automate the entire process keeping in view of the database integration approach.
User friendliness is provided in the application with various controls. The system makes the overall project management much easier and flexible. Readily upload the latest updates, allows user to download the alerts by clicking the URL. There is no risk of data mismanagement at any level while the project development is under process. It provides high level of security with different level of authentication

Objectives: The student should take up the case studies of ATM system, Online Reservation System and Model it in different views i.e. Use case view, logical view, component view, Deployment view.

Week 1
Design a Use case Diagram for ATM system, Online Reservation System

Week 2
Design a Sequence Diagram for ATM system, Online Reservation System. Design a Collaboration Diagram for ATM system, Online Reservation System.

Week 3
Design a Activity Diagram for ATM system, Online Reservation System.
Design a State Chart Diagram for ATM system, Online Reservation System.

Week 4
Design a Class Diagram for ATM system, Online Reservation System.

Week 5
Design a Component Diagram for ATM system, Online Reservation System.

Week 6
Design a Deployment Diagram for ATM system, Online Reservation System.

Course Outcomes:
Upon completion of this course, students should be able to:
1. Analyze the requirements through Use-Case View
2. Identify all structural and behavioral concepts of the entire system
3. Develop a model using UML concepts by different types of diagrams like Usecase Diagram, Class Diagram, Sequence Diagram etc
CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisites: NIL

Course objectives: To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

MODULE- I [07 Periods]
Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

MODULE-II [06 Periods]
Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

MODULE-III [06 Periods]
A: Legal frame work and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);

MODULE-IV [06 Periods]
Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

MODULE-V [07 Periods]
Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.
REFERENCE:
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
4. "Knowledge Traditions and Practices of India” Kapil Kapoor1, Michel Danino2

E- RESOURCES:
1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

Course outcomes:
At the end of the course, students will be able to:
1. Understand the concept of Traditional knowledge and its importance
2. Know the need and importance of protecting traditional knowledge.
3. Know the various enactments related to the protection of traditional knowledge.
4. Understand the concepts of Intellectual property to protect the traditional knowledge.
5. Know the various streams of Indian traditional knowledge.

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Prerequisites: Nil

Course Objectives:
Through reading the text, references and discussion of cases students should be able to understand the fundamentals underlying the management of an organization.

MODULE – I: Management and Principles of Management [09 Periods]

MODULE – II: Planning, Organization and types of Structures [10 Periods]
Organization and types of Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types of Organizations- Line organization, Line and staff organization, functional organization, committee organization, matrix organization, Virtual Organization, Cellular Organization, boundary less organization, inverted pyramid structure, lean and flat Organization structure.

MODULE – III: Staffing and controlling [10 Periods]
B. Controlling: process of controlling, types of controlling, managing productivity, Quality Control: chart, R chart, C chart, P chart, (simple Problems), Deming’s contribution to quality.

MODULE – IV: Operations and Materials Management [09 Periods]
Operations Management: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement.
Materials Management: Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records.

Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems)

Contemporary Management Practices: Basic concepts of ERP, Just-In-Time (JIT) System, Total Quality Management (TQM), six sigma and Capability Maturity Model (CMM) Levels, Benchmarking, Balanced Scorecard.

TEXT BOOKS:

REFERENCES:

E RESOURCES:
5. http://nptel.ac.in/courses/110105034/

Course Outcomes:
After completion of the course, students will be able to:
1. Understand the various concepts, principles and theories of management.
2. Understand the basic concepts of planning and various structures of organizations.
3. Understand the process of staffing and controlling
4. Understand the process of operations management. Also learn the concepts of materials management and marketing management at an organization.
5. Understand the various contemporary management practices. Also the project management techniques.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

196
Prerequisites: NIL

Course Objectives:
This course provides the students to understand stages in building a Data Warehouse, identify the need and importance of preprocessing techniques, implement similarity and dissimilarity techniques, analyze and evaluate performance of algorithms for Association Rules, analyze Classification and Clustering algorithms.

MODULE I: Introduction and Mining Issues & Data [09 Periods]
Mining Issues and Data - Major Issues in Data Mining, Types of Data, Data Quality

MODULE II: Data, Measuring Data Similarity and Dissimilarity [10 Periods]
Data - Data Pre-processing, Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Data Discretization and Binarization, Variable transformation.
Measuring Data Similarity and Dissimilarity - Similarity and Dissimilarity between simple attributes, Dissimilarities and similarities between data objects, Examples of Proximity measures, Issues in Proximity Calculation, Selection of right proximity measure.

MODULE III: Classification and Techniques [09 Periods]
A: Classification - Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree.
B: Techniques - Methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

MODULE IV: Classifier and Association Analysis [10 Periods]
Classifiers - Alternative Techniques, Bayes’ Theorem, Naïve Bayesian Classification, Bayesian Belief Networks
Association Analysis - Basic Concepts and Algorithms: Problem Definition, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm.
MODULE V: Cluster Analysis and DBSCAN  [10 Periods]


DBSCAN - Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.

TEXT BOOKS
2. Jiawei Han, Michel Kamber,”Data Mining concepts and Techniques”, 3/e, Elsevier.

REFERENCES
4. Alex Berson, Stephen Smith ,”Data Warehousing Data Mining & OLAP”, TMH.

E-RESOURCES
5. https://gunjesh.wordpress.com/

Course Outcomes:
At the end of the course, students will be able to
1. Acquire knowledge in building a Data Warehouse
2. Understand the need and importance of preprocessing techniques
3. Implement Similarity and dissimilarity techniques
5. Deploy Classification and Clustering algorithms

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
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**Prerequisites:** Basic knowledge of computer architecture, programming and communication protocols

**Course Objectives:**
Understand the basics of Embedded System, IoT and the development model. Understand the architecture, Instruction set and work on ARM microcontroller using practical hands-on. Ability to select appropriate hardware and microcontrollers based on need of application. Understand the Internet of Things Standards, Frameworks and Techniques. Apply the tools, techniques and skills acquired towards development of Projects.

**MODULE I - Introduction to Embedded Systems and Internet of Things (IOT)**

[09 Periods]

**MODULE II - Overview of Open Source Hardware and Its relevance to IOT**

[09 Periods]
Introduction and Programming Arduino Development Board, Working with Sensor Integration, Interfacing Input / Output devices (Pot, LDR, LCD, etc), Introduction to Network Connectivity, Concepts of IP based communication, Client – Server model of communication, Introduction to Wi-Fi communication using ESP8266, ESP8266 in Station & Access Point Mode

**MODULE III – Fundamentals of Python Programming & Raspberry PI**

[10 Periods]
Introduction to python programming, Working with functions, classes, REST full Web Services, Client Libraries, Introduction & programming Raspberry Pi3, Integrating Input Output devices with Raspberry Pi3

**MODULE IV – IOT Platform: Cloud Computing Platforms for IOT Development (IBM Cloud)**

[10 Periods]
IOT Platform Architecture (IBM Internet of Things & Watson Platforms), API Endpoints for Platform Services, Devices Creation and Data Transmission, Introduction to NODE-RED and Application deployment

**MODULE V – IOT Usecases: Smartcity Project & Industrial Usecases**

[10 Periods]
Introduction to SmartCity Project & IOT Usecases, Development of Smartcity Applications, Project Work-1 (Smartcity Usecase), Project Work-2 (Industrial Usecase)

**TEXT BOOKS**
1. Internet of Things: A Hands-On Approach by by Arsheep Bahga, Vijay Madisetti
2. The Internet of Things: Key applications and Protocols | Wiley Publications 2nd Edition

**REFERENCES**
2. Designing the Internet of Things by Adrian McEwen, Hakim Cassimally, Wiley Publications, 2012

**E-RESOURCES**
9. https://books.google.co.in/books?id=JPKGBAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
12. https://pdfs.semanticscholar.org/474a/4a3d4be882f6a40fe655f4b9ec3cf7dc08e0.pdf

**Course Outcomes:**
At the end of the course, students will be able to
1. **Describe** the fundamental concepts of IoT and its applications
2. **Illustrate** M2M concepts with protocols.
3. **Develop** applications using Python Scripting Language.
4. **Build** real world applications by applying Raspberry PI.
5. **Examine** web based services.

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Prerequisite: NIL

Course Objectives:
This course provides the students to understand stages in building a Data Warehouse, identify the need and importance of preprocessing techniques, implement similarity and dissimilarity techniques, analyze and evaluate performance of algorithms for Association Rules, analyze Classification and Clustering algorithms.

Software Requirements: WEKA TOOL

List of Programs:
1. Demonstration of preprocessing on dataset student.arff.
2. Implementation of preprocessing on dataset labor.arff.
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori Algorithm.
4. Implement Association rule process on dataset test.arff using apriori algorithm.
5. Apply classification rule process on dataset student.arff using j48 algorithm.
7. Use classification rule process on dataset employee.arff using id3 algorithm.
8. Deploy classification rule process on dataset employee.arff using naïve bayes Algorithm.
9. Implement clustering rule process on dataset iris.arff using simple k-means.
10. Make use of clustering rule process on dataset student.arff using simple k- means.
11. Design a decision tree by pruning the nodes on your own. Convert the decision trees into “if-then-else rules”. The decision tree must consists of 2-3 levels and convert it into a set of rules.
12. Generate Association rules for the following transactional database using Apriori algorithm.

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</table>
TEXT BOOKS
2. Jiawei Han, Michel Kamber, "Data Mining concepts and Techniques", 3/e, Elsevier.

REFERENCES
4. Alex Berson, Stephen Smith, ”Data Warehousing Data Mining & OLAP”, TMH.

Course Outcomes:
At the end of the course, students will be able to
1. Analyze the classification rules on various databases.
2. Deploy association rules for any kind of databases.
3. Develop clustering rules for applications.

<table>
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<th>CO- PO Mapping</th>
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Experiment – 1:
Getting started with Arduino Platform, Integrate Input & Output devices
In this experiment student will setup the environment for programming Arduino UNO development boards. Explore the command set and integrates the sensors like LDR, Potentiometer, LED’s, LCD display, Pushbuttons and Servo Motor.

Experiment – 2:
Explore the sensor datasheet & integrate with Arduino UNO board
In this lab experiment student will understand how to read the datasheet of a sensor, its power requirement, connection diagram. The sensors (Temperature Sensor (LM35), Ultrasonic, Digital Temperature & Humidity sensor) will be integrated with Arduino UNO platform and programmed to capture the data.

Experiment – 3:
Getting Started with ESP8266(NodeMCU) development board, explore client server model of communication
In this experiment the student will setup the environment for programming ESP8266 and configures it into station & access point mode. He will convert ESP8266 into a webserver, which receives data and commands from a client in the same network.

Experiment – 4:
Get hands-on with Raspberry Pi, Build an IoT Gateway with Raspberry Pi
This lab is designed to program the raspberry pi GPIO pins, enabling network connection, installing webserver along with database on Rpi.

Experiment – 5:
The raspberry pi will act as a gateway and receives the data from multiple ESP8266 devices in the network.

Experiment – 6:
Explore different communication technologies & protocols
In this lab experiment we will explore the use of Bluetooth, Zigbee, GSM/GPRS and

Experiment – 7:
RFID communication technologies along with latest communication protocols like MQTT and CoAP.

**Experiment – 8:**
**Configure IBM Watson IoT Platform to Receive Events & Send Commands**
In this lab student will understand the features of IBM Watson IoT platform, explore the API Endpoints, RESTful Webservices, etc.

**Experiment – 9:**
Get hands-on exposure to Node-RED tool Integrate the ESP8266 to IBM Watson IoT platform and exchange the events & commands

**Experiment – 10:**
**Build end-to-end IoT Usecase with Device – Gateway – Cloud – Application model**
In this experiments students will build a usecase with end to end development. Following are some of the examples
- Smart Street Lighting System
- Smart Home Management System

**Experiment – 11:**
Smart Water Management System
Integrate the ESP8266 to IBM Watson IoT platform and exchange the events & commands

**Experiment – 12:**
**Build end-to-end IoT Usecase with Device – Gateway – Cloud – Application model**
In this experiments students will build a usecase with end to end development. Following are some of the examples
- Smart Street Lighting System
- Smart Home Management System
- Smart Water Management System

**Course Outcomes:**
At the end of the course, students will be able to
1. **Describe** the fundamental concepts of IoT and its applications
2. **Illustrate** M2M concepts with protocols.
3. **Develop** applications using Python Scripting Language.
4. **Build** real world applications by applying Raspberry PI.
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Professional Elective – V
Prerequisites: Formal Languages and Automata Theory

Course Objectives:
This course provides a broad introduction to NLP to determine whether the algorithm answers the goals of its designers, or if the system meets the needs of its users. And to demonstrate NLP with regular expression, Python programming, demonstrate Context Free Grammar, Probability theory to analyze various models of language, implement Naive Bayes, HMM, explore in detail about Probabilistic Context Free Grammars, Models, parsers and classifiers, grammar and techniques.

Module I: Introduction and Regular Expressions [10 Periods]

Natural Language Processing (NLP) - Introduction to NLP, Hands-on demonstrations, Ambiguity and uncertainty in language, Turing test, Chomsky hierarchy, regular languages, and limitations, Finite-state automata, Practical regular expressions for finding and counting language phenomena.

Programming in Python - Programming in Python and String Edit Distance and Alignment: An introduction to programming in Python, Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. NLTK, String Edit Distance and Alignment Key algorithmic tool: Dynamic programming, String edit operations, Edit distance, and examples of use in spelling correction, and machine translation.

Module II: Context Free Grammars and Probability [09 Periods]

CFG - Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down and Bottom-up parsing. Non-probabilistic Parsing Efficient CFG parsing with CYK, Dynamic programming algorithms, Early parser, Designing a little grammar, and parsing with test data.


Module III: Language Models [10 Periods]

Module IV: Probabilistic and Classifiers

Probabilistic Context Free Grammars - Weighted context free grammars, Weighted CYK, Pruning and beam search, Parsing with PCFG, Probabilistic version of CYK, Human parsing, Experiments with Eye-Tracking.

Parsers and Classifiers - Modern parsers, Maximum Entropy Classifiers-The maximum entropy principle and its relation to maximum likelihood, Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks.

Module V: Grammar and Techniques


TEXT BOOKS
1. Jurafsky and Martin, “Speech and Language Processing”, Prentice Hall

REFERENCES

E-RESOURCES
2. https://hpi.de/fileadmin/user_upload/fachgebiete/plattner/teaching/NaturalLanguageProcessing/NLP2016/NLP01_IntroNLP.pdf
4. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.34.1r036
5. http://nptel.ac.in/courses/106101007/
6. http://nptel.ac.in/courses/106105158/

Course Outcomes:
At the end of the course, students will be able to
1. Be able to compose key NLP elements to develop higher level processing chains and Assess Evaluate NLP based systems and apply Python programming concepts in NLP.
2. Choose appropriate solutions CFG, probability for solving typical NLP sub problems
3. Analyze NLP problems to decompose them in adequate independent components, models, and its applications.
4. **Evaluate** language technology component use of probabilistic context free grammars, parsers and classifiers.

5. **Elaborate** the interaction between Grammar, models and techniques used in NLP.

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CO- PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Software Engineering

Course Objectives:
This Course enables the students to understand the principles and need for various types of testing test adequacy assessment using: data flow, transaction flow and path testing, describe strategies for generating system test cases, apply the essential characteristics of path product and regular expressions, explain about the people and organizational issues in Testing.

MODULE I: Introduction to Software Testing and Defects [08 Periods]
Introduction-Purpose of testing-Dichotomies-Software Testing Principles- Bugs, consequences of bugs, Taxonomy of bugs -The Tester’s Role in a Software Development Organization-Black box testing and white box testing.

Defects- Cost of defects- Defect Classes- Defect Examples, software testing life cycle.

MODULE II: Testing Techniques [10 Periods]
Flow graphs and Path Testing- Basics concepts of path testing-predicates-achievable paths- path sensitizing- path instrumentation, application of path testing.
Transaction and Data Flow Testing- Transaction flows- transaction flow testing techniques, Basics of dataflow testing - strategies in data flow testing–application of data flow testing.

MODULE III: Test Case Approaches and Testing Types [11 Periods]
A: Test Case Design Strategies

B: Testing Types
Alpha, Beta Tests, Usability and Accessibility testing – Configuration testing – Compatibility testing – Testing the documentation.

MODULE IV: Path Testing and Applications [10 Periods]
Paths, Path products and Regular Expressions-Path products and path expression-reduction procedure- applications- regular expressions and flow anomaly detection.
Logic Based Testing, State Graphs and Transition Testing- Overview decision tables-path expressions, k-v charts, state, State graphs, transition testing, good and bad state graphs, state testing, testability tips.

MODULE V: Software Testing Tools and Graph Matrices [09 Periods]
Graph Matrices and Applications- Motivational over view, matrix of graph, relations, power of matrix, node reduction algorithm.

TEXTBOOKS:

REFERENCES:

E-RESOURCES
1. https://books.google.co.in/books?isbn=8177222600
2. https://books.google.co.in/books?isbn=817758121X
4. http://nptel.ac.in/courses/106101061/18#

Course Outcomes:
At the end of the course, students will be able to
1. Analyze the Conventional Software Management and improving Software Economics.
2. Demonstrate the principles of conventional software Engineering, Life cycle Phases, and Artifacts of the process.
3. Apply the Software testing Work Flows of the process, Checkpoints of the process and Iterative Process Planning.
4. Develop automation Process, Project Control and Process instrumentation, tailoring the process in software testing.
   Evaluate the project organizations and responsibilities, future software project management with case study.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Course objectives: To understand the Wireless communication Environment, GSM and MANNET.

MODULE I: Introduction [09 Periods]
GSM-Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

MODULE II: MAC [09 Periods]
A: Motivation for a Specialized MAC (Hidden and Exposed Terminals, Near and Far Terminals).
B: SDMA, FDMA, TDMA, CDMA, MAC Protocols for GSM.

MODULE III: Mobile IP Network Layer [09 Periods]
Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

MODULE IV: Mobile IP Transport Layer [09 Periods]
Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP,Fast retransmit/fast recovery, Transmission/ time-out freezing, Selective retransmission, Transaction oriented TCP.

MODULE V: Data Base Issues and Data Dissemination [12 Periods]
Database Issues - Hoarding techniques, caching invalidation mechanisms.
Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

TEXT BOOKS:

REFERENCES:
**Course Outcomes:**
At the end of the course, student will be able to:
1. Learn the different wireless communication technologies, understand the protocols used in the layered architecture.
2. Define WLAN and different WLAN transmission technologies.
3. Explain different types of WLANs, learn about GSM.
5. Explain different routing algorithms used in Mobile Ad hoc Networks (MANET).

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Professional Elective – VI
Prerequisites: NIL
Course Objectives:
This course makes the students to understand the basic concepts security policies, interpret security objectives, various catalog approaches, analyze cyber user, conflict, management, infrastructure issues, investigate various case studies on cyber security policies.

MODULE I: Policies and Security Evolution [10 Periods]
Introduction - Cyber Security, Cyber Security policy, Domain of Cyber Security Policy, Laws and Regulations

MODULE II: Cyber Security Objectives and Guidance [10 Periods]
Catalog Approach - Cyber Security Management, Arriving at Goals, Cyber Security Documentation, the Catalog Approach, Catalog Format, Cyber Security Policy Taxonomy

MODULE III: Policy Catalog and Issues [10 Periods]
A: Cyber Security Policy Catalog - Cyber Governance Issues, Net Neutrality, Internet Names and Numbers, Copyright and Trademarks, Email and Messaging, Cyber User Issues, Malvertising, Impersonation.
B: Cyber user and conflict Issues - Appropriate Use, Cyber Crime, Geo location, Privacy, Cyber Conflict Issues, Intellectual property Theft, Cyber Espionage, Cyber Sabotage, Cyber Welfare.

MODULE IV: Cyber Management and Infrastructures Issues [09 Periods]
Cyber Infrastructure Issues - Principles – Research and Development – Cyber Infrastructure Issue – Banking and finance – Health care – Industrial Control systems.

MODULE V: Case Study [09 Periods]

Espionage - The rise of cyber crime- Espionage and Nation-state Actions-Policy response to growing Espionage threats-Congressional Action.

TEXT BOOKS

REFERENCES
1. Richard A. Clarke, Robert Knake “Cyberwar: The Next Threat to National Security & What to Do About It” Ecco 2010

E-RESOURCES
5. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY77N9KJP4BJuXxkVQSJo9iLOOfgbY8enNTX_Gat1aW0f-JrSQu1YTNmVwRFJ_mJ7Q
6. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY737OF52a5kP6Ph6KB9KG9RiRGN-S5LJolO6-Z-TBERz0mAxCmQX4GTFW2WfvuCVAg

Course Outcomes:
At the end of the course, student will be able to
1. Explore various security policies and evolution of security.
2. Investigate more on various catalog approaches and cyber security objectives.
3. Analyze cyber user and conflict issues.
4. Review cyber management and infrastructure issues.
5. Examine various case studies on cyber security policies.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisites: Web Technologies

Course Objectives:
This course enables the students to learn and understand the fundamental technologies for enabling the envisioned semantic web, study various knowledge representation techniques, make use of development tools and methods for ontology engineering, construct application and services using semantic web technologies and analyze various collaboration networks.

MODULE I: World Wide Web [09 Periods]
Web Description - Ontology, Inference Engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

MODULE II: Knowledge Representation for the Semantic Web [10 Periods]
Ontology - Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web - Resource Description Framework (RDF) / RDF Schema,

MODULE III: Ontology Engineering [10 Periods]
A: Ontology Development - Ontology Engineering, constructing Ontology, Ontology Development Tools, Ontology Methods
B: Ontology Sharing and Merging - Ontology Sharing and Merging, Ontology Libraries and Ontology mapping, Logic, Rule and Inference Engines.

MODULE IV: Semantic Web Applications, Services and Technology[10 Periods]
Semantic Web Services - Semantic Web applications and services, Semantic Search, e-learning
Semantic Web Applications - Semantic Bioinformatics, Knowledge Base, XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods

MODULE V: Social Network Analysis and Semantic Web [09 Periods]
Social Network Analysis - What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis - Electronic Discussion networks.

Semantic Web - Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with social network features.

TEXT BOOKS

REFERENCES

E-RESOURCES
3. https://research.vu.nl/ws/portalfiles/portal/2312133
4. http://nptel.ac.in/courses/106105077/18

Course Outcomes:
At the end of the course, students will be able to
1. Develop web applications using semantic techniques.
2. Relate knowledge representation methods for semantic web.
3. Explain the key aspects of ontology engineering.
4. Design web services and its applications.

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5. Analyze and build a social network.
Prerequisites: NIL

Course Objectives:
Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project. Compare and differentiate organization structures and project structures. Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.

Module I [09 Periods]

Module II [09 Periods]

Module III [10 Periods]
A: Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments.
B: Process Planning: Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

Module IV [10 Periods]
Project Organizations: Line-of-business organizations, project organizations, evolution of organizations, process automation.
Project Control and process instrumentation: The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, and metrics automation.

Module V [10 Periods]

TEXT BOOKS:
2. Software Project Management, Walker Royce, Pearson Education.

REFERENCE:

Course Outcomes:
At the end of the course, students should be able to
1. Apply software framework, process, and models in development.
2. Implements the Life cycle process and models in production stages and improve software by economics and management.
3. Planning and scheduling the process with cost estimation and Analyze work flow in process at major milestones by periodic assessment.
4. Use of projects in organizations in line of business with process automations and project control with quality metrics.
5. Analyze next generation software with case study applications.

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**Course Code:** 80139  
**Course Name:** ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSIS  
**Department:** B.Tech.  
**Module:** [OPEN ELECTIVE]  
**Credits:** 3

**Prerequisites:** Environmental Sciences  
**Course Objectives:** The main objective of this course is to provide in-depth knowledge about various methodologies in assessing the environmental impact of various developmental projects. It also provides the knowledge to design a more publicly acceptable project which helps in achieving sustainable development.

**MODULE I**  
[10 Periods]  
**Concept of EIA:** Significance of EIA, Factors affecting EIA, Classification of Environmental Parameters, Elements of EIA: Initial Environmental Examination, Preparation of Environmental Base map, Impact Evaluation and Analysis, Environmental Impact Statement (EIS) and Environmental Management Plan (EMP), List of Projects which require EIA.  
**EIA Methodologies:** General methodology of EIA with flow chart, EIA Methods: Ad-hoc methods, Matrix methods, Network methods, Environmental Media Quality Index method, Overlay methods, Cost/Benefit Analysis.

**MODULE II**  
[10 Periods]  
**EIA of Soil:** Methodology for the assessment of developmental activities on Soil: Delineation of study area, Identification of impacts, Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures, Environmental impacts of Deforestation: Causes, Effects and Mitigation measures.  
**EIA of Ground water:** Ground water quantity and quality impacts, Systematic method for evaluation of various developmental activities on Ground water environment.  
**EIA of Surface water:** Introduction, Projects which create concerns, Methodology for the assessment of Impacts on surface water environment.

**MODULE III**  
[10 Periods]  
**A: EIA of Air and Noise environment:** Air Pollution sources, Generalized approach for assessment of air pollution impact, Effects of Noise on people and their physiological responses, systematic methodology for assessing environmental impacts of noise  
**B: EIA of Biological Environment**  
Introduction to Biodiversity and Systematic approach for evaluating Biological impacts. Assessment of impacts of developmental activities on Vegetation and Wild life.
MODULE IV                          [09 Periods]
Environmental Audit: Objectives, Advantages, Types of environmental Audit, Audit protocol, Stages of Environmental Audit: Pre-audit activities, Onsite activities and Post audit activities.

MODULE V                                [09 Periods]
Life Cycle Assessment: Definition, Scope, Methodology, its applications and drawbacks.
Case studies: Preparation of EIA for developmental activities: Industrial projects, Land clearing projects, River valley projects, Construction projects, Highways and Road projects.

TEXT BOOKS:

REFERENCES:

E-RESOURCES

Course Outcomes:
At the end of the course, students will be able to
1. Understand the significance of EIA and the methodologies used for assessing the environmental impacts of developmental projects.
2. Identify, predict and assess the impacts of projects on soil, ground water and surface water environment.
3. Identify a systematic methodology for assessing environmental impacts of projects on air, noise and biological environment.
4. Gain knowledge on various Environmental legislations, policies and Acts.
5. Acquire knowledge on environmental audit, procedure and preparation of audit report.
## CO- PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisite: NIL

Course Objectives:
The purpose of the course is to provide an overview of emerging delivery systems for high performance green buildings and the basis on which their sustainability can be evaluated.

MODULE I
Introduction to green buildings, green materials, sources of green materials, high-performance green buildings Impacts of building construction, operation, and disposal Methods and tools for building assessment, Green Globes

MODULE II
The green building process, Design and construction relationships, benefits of green building quality, healthy and safe environments, Site and landscape strategies.

MODULE III
A: Building energy system strategies, Water cycle strategies, Materials selection strategies, Indoor Environmental Quality [IEQ]
B: Analysis and strategies, Construction, team responsibilities and controls, Building commissioning strategies

MODULE IV
Economic issues and analysis, Use of the Green Strategies cost estimating tool, Future directions in green, high performance building technologies

MODULE V

TEXT BOOKS

REFERENCES

E-RESOURCES

**Course Outcomes:**
At the end of the course, students will be able to
1. Identify green Building Materials and their Sources.
2. Understand the construction process of green buildings and their benefits quality, healthy and safe environments
3. Learn the strategies to construct green buildings.
4. Identify the issues a raised due to construction of green buildings
5. Gain knowledge on the case studies of green buildings.

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Prerequisite: NIL
Course Objectives: This course provides the knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences along with International Strategy for Disaster Reduction. It also has the potential to make the student design and implement disaster mitigation measures.

MODULE I: Concept of Hazards and Disasters [10 Periods]
Types of Environmental Hazards & Disasters Natural hazards and Disasters – Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra-Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards.

MODULE II: Classification of Hazards [10 Periods]

MODULE III: Approaches and Measures in Disaster Management [10 Periods]

A: Emerging Approaches

Three Stages: Pre-disaster stage (preparedness), Emergency Stage, Post Disaster stage (Rehabilitation).

B: Natural Disaster Reduction & Management

Provision of Immediate relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards

MODULE IV: Disaster Management [09 Periods]

An integrated approach for disaster preparedness, mitigation & awareness. Mitigation-Institutions- discuss the work of following Institution.

a. Meteorological Observatory
b. Seismological Observatory
c. Volcano logical Institution
d. Hydrology Laboratory
e. Industrial Safety Inspectorate
f. Institution of Urban & Regional Planners
g. Chambers of Architects
h. Engineering Council
i. National Standards Committee

Integrated Planning- Contingency Management Preparedness —

a] Education on disasters
b] Community involvement
c] The adjustment of Human Population to Natural Hazards & Disasters Role of Media

Monitoring Management- Discuss the programme of disaster research & mitigation of disaster of following organizations.

b] World Federation of Engineering Organizations [WFED]
c] National Academy of Sciences
d] World Meteorological Organizations [WMO]
e] Geographical Information System [GIS]
f] International Association of Seismology & Physics of Earth’s Interior [IASPEI]
g] Various U.N agencies like UNCRD, IDNDR, WHO, UNESCO, UNICEF, UNEP.

MODULE V: Disaster Management in India [09 Periods]

A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India

Ecological planning for sustainability & sustainable development in India- Sustainable rural development: A Remedy to Disasters-Role of Panchayats in Disaster mitigations C: Environmental policies & programmes in India- Institutions & National Centers for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & Training.
TEXT BOOKS:

REFERENCES:

E RESOURCES:

Course Outcomes:
At the end of the course, students will be able to
1. Analyze, evaluate and manage the environmental, social, cultural, economical, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
2. Assess the different public health aspects at local and global levels as a result of Disaster and can plan well to mitigate them.
3. Gain knowledge in various emerging approaches and measure in disaster management.
4. Understand the role of disaster management through Meteorological Observatory, Seismological Observatory, Volcanological Institution, etc.,
5. Acquire the information about Disaster Management, Ecological planning and sustainable development and Environmental policies, Disaster Reduction programs in India.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Nil

Course Objectives: This course deals about the concept of energy conservation, energy management and different approaches of energy conservation in industries, economic aspects of energy conservation project and energy audit in commercial and industrial sector.

MODULE I Basic Principles of Energy Audit [9 Periods]
Energy audit - definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes - Energy audit of industries - Energy saving potential, energy audit of process industry, thermal power station, building energy audit.

MODULE II Energy Management [9 Periods]
Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting, Energy manager, Qualities and functions, language, Questionnaire - check list for top management.

MODULE III Energy Efficient Motors [10 Periods]
B: Characteristics - Variable speed, variable duty cycle systems, RMS hp - Voltage variation - Voltage unbalance - Over motoring - Motor energy audit.

MODULE IV Power Factor Improvement, Lighting & Energy Instruments [10 Periods]
Power Factor Improvement, Lighting: Power factor – Methods of improvement, location of capacitors, Pf with non linear loads, effect of harmonics on power factor. Power factor motor controllers - Good lighting system design and practice, lighting control, lighting energy audit.
Energy Instruments: Watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC’s.

MODULE V Economic Aspects and Analysis [10 Periods]
Economics Analysis - Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Energy efficient motors, Calculation of simple payback method, net present worth method - Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.
TEXT BOOKS

REFERENCES

E - RESOURCES
2. https://beeindia.gov.in/

Course Outcomes
At the end of the course, students should be able to
1. Examine the principles of Energy audit and its process in thermal power station, industries.
2. Analyze the different aspects of energy management.
3. Describe the characteristics of energy efficient motors.
4. Illustrate the power factor improvement, good lighting system practice and the types of energy instruments
5. Analyze the economic aspects of Energy Management.

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Prerequisites: NIL

Course Objectives:
This course deals with the general safety requirements during the electrical installations. The course emphasis on the various objectives of energy management and auditing.

MODULE I RULES & REGULATIONS [10 Periods]

MODULE II INSTALLATION AND EARTHING OF EQUIPMENTS [10 Periods]

MODULE III SAFETY MANAGEMENT AND FIRST AID [09 Periods]

MODULE IV FIRE EXTINGUISHERS [10 Periods]

**MODULE V ENERGY MANAGEMENT & ENERGY AUDITING** [09 Periods]
Objectives of energy management – energy efficient electrical systems – energy conservation and energy policy – renewable source of energy – energy auditing – types and tips for improvement in industry.

**TEXT BOOKS**

**REFERENCES**

**E-RESOURCES**
1. http://nptel.ac.in/courses/103106071/5
2. https://beeindia.gov.in/

**Course Outcomes**
At the end of the course, students should be able to
1. Gain basic knowledge on Indian Power sector organization and their roles.
2. Understand the concepts of earthing and its standards.
3. Acquire the basic knowledge on First aid and safety during electrical installation.
4. Distinguish various fire extinguishers and their classification.
5. Understand the basic concepts of energy auditing.

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Prerequisites: NIL.

Course Objectives: This course deals with the need for electrical energy storage, different electrical storage technologies, types and features of energy storage systems and the applications of electrical energy storage.

MODULE I: ELECTRICAL ENERGY STORAGE TECHNOLOGIES  
[10 Periods]
Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

MODULE II: NEEDS FOR ELECTRICAL ENERGY STORAGE  
[10 Periods]
Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses. The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

MODULE III: FEATURES OF ENERGY STORAGE SYSTEMS  
[10 Periods]
A: Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES).
B: Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

MODULE IV: TYPES OF ELECTRICAL ENERGY STORAGE SYSTEMS  
[09 Periods]
Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES), Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

MODULE V APPLICATIONS  
[09 Periods]
Present status of applications, Utility use (conventional power generation, grid operation & service), Consumer use (uninterruptable power supply for large consumers), New trends in applications, Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems, Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA– aggregation of many dispersed batteries.
**TEXT BOOKS**

**REFERENCES**

**E - RESOURCES**
1. http://nptel.ac.in/courses/108105058/

**Course outcomes**
At the end of the course, students should be able to
1. Understand the different types of electrical energy storage technologies.
2. Learn about the need for electrical energy storage.
3. Comprehend the various features energy storage systems.
4. Understand the various types of electrical energy storage systems.
5. Emphasize the various applications of electrical energy storage.

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**Course Objectives:**
To give the students an overview of quality and TQM and explaining the salient contributions of Quality Gurus like Deming, Juran and Crosby and general barriers in implementing TQM and also get basic knowledge about ISO.

**MODULE I: Introduction**

**MODULE II: TQM Principles**
Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

**MODULE III: Statistical Process Control (SPC)**
A: Statistical fundamentals – Measures of central Tendency and Dispersion - Population and Sample.

**MODULE IV: TQM Tools**
Bench marking -Reason to bench mark, Bench marking process - FMEA - Stages, Types. Quality Function Deployment (QFD) - House of Quality - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures

**MODULE V: Quality Systems**
TEXT BOOKS

REFERENCES

E - RESOURCES
2. https://onlinecourses.nptel.ac.in/noc17_mg18
3. nptel.ac.in/courses/122106032/Pdf/4_2.pdf
4. www.thecqi.org
5. www.emeraldinsight.com/journal/tqm

Course outcomes
At the end of the course, students will be able to
1. Gain basic knowledge in total quality management relevant to both manufacturing and service industry.
2. Implement the basic principles of TQM in manufacturing and service based organization.
3. Apply various SPC tools in real time manufacturing and service industry.
4. Implement various TQM tools like FMEA & QFD.
5. Apply various ISO Standards for real time applications.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Nil

Course Objectives:
The purpose of this course is to teach the concept of Industrial Safety & provide useful practical knowledge for workplace safety which helps identification, evaluation and control of all the hazards and potential hazards to prevent or mitigate harm or damage to people, property or the environment.

MODULE I: Introduction [10 Periods]
Definition-Development before industrial revolution-Milestones in industrial safety movement Development of accident prevention programs-3 E’s of safety-Development of Safety organizations-Safety and health movement- Managing emergency in industries.

MODULE II: Accident Prevention [10 Periods]

MODULE III: Safety Organization & Industrial Hygiene and Hazards [10 Periods]
B: OSHA and industrial hygiene-work site analysis-recognizing and controlling hazards Occupational diseases prevention-Employee welfare-Statutory welfare schemes, Non statutory schemes-Health hazards-Control strategies- Fire hazards and prevention, Electrical hazard prevention and safety.

MODULE IV: Industrial Process Safety [09 Periods]
Management-Assessing organizations safety effectiveness.

MODULE V: Human Side of Safety [09 Periods]
Management of change-Process and equipment integrity-Human behavior aspects and modes-The Swiss cheese model of industrial accidents-Active and Latent failures-examples - Safety lessons Human Factors influencing the likelihood of failure-Organizational culture, Demographic effects.

TEXT BOOKS

REFERENCES

E - RESOURCES

Course outcomes
At the end of the course, students should be able to
1. Identify the evaluation of industrial safety and health standards.
2. Analyze the philosophies behind industrial accidents.
3. Apply the hierarchical levels in a safety organization and apply the types of industrial hazards and preventive measures.
4. Implement the concept of industrial process safety.
5. Apply the safety procedures for human.

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Prerequisites: Nil

Course Objectives:
The objective of this subject is to provide knowledge about different non-conventional energy sources.

MODULE I: Principles of Solar Radiation
[10 Periods]
Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

MODULE II: Solar Energy
[10 Periods]
Solar Collectors: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

MODULE III: Wind Energy & Bio-Mass
[10 Periods]
A: Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

MODULE IV: Geothermal Energy & Ocean Energy
[09 Periods]

MODULE V: Direct Energy Conversion
[09 Periods]
Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, merit, materials, applications. MHD generators - principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems. Electron gas dynamic conversion - economic aspects. Fuel cells - Principles of Faraday’s law’s, thermodynamic aspects, selection of fuels and operating conditions.
TEXT BOOKS

REFERENCES

E - RESOURCES
1. nptel.ac.in/courses/112105051/
3. faculty.itu.edu.tr/onbasiogl1/DosyaGetir/62002
5. www.ijrer.org

Course Outcomes
At the end of the course, students will be able to
1. Understand the principles of solar radiation
2. Recognize solar collectors, Solar energy storage and its applications
3. Classify the harvesting of wind energy & bio-mass energy.
4. Understand the harvesting of geothermal energy & ocean energy.
5. Apply the direct energy conversion methods

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Prerequisites: Microprocessors and Microcontrollers.

Course Objectives: This course introduces the difference between Embedded Systems and General purpose systems. This course familiarizes to compare different approaches in optimizing General purpose processors. This course provides the design tradeoffs made by different models of embedded systems.

Module-I: Introduction to Embedded Systems


Module - II: Typical Embedded System

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Module - III: Embedded Firmware

B: Embedded Firmware Design Approaches and Development Languages.

Module - IV: RTOS Based Embedded System Design

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Module - V: Task Communication

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOKS:

REFERENCES:
3. David E. Simon, “**An Embedded Software Primer**”, Pearson Education.

**E-RESOURCES:**
2. https://www.researchgate.net/.../228619090_Resource_Management_for_EMBEDDED_Sy...
3. https://electronicsforu.com › Resources › Learning Corner
4. https://nptel.ac.in/courses/108102045/
5. nptel.ac.in/courses/.../IIT%20Kharagpur/Embedded%20systems/New_index1.html

**Course Outcomes:**
At the end of the course students are able to:
1. Understand the basics of an embedded system.
2. Design, implement and test an embedded system.
3. Understand the design tradeoffs made by different models of embedded systems.
4. Know types of operating systems
5. Learn how to choose RTOS

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**Course Objectives:**
To study different modulation techniques used in analog communications and digital communications. To also introduce basics of satellite and optical communications.

**MODULE I: Fundamentals of Analog Communication [10 Periods]**
Principles of amplitude modulation, AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM Voltage distribution, AM power distribution, Angle modulation - FM and PM waveforms, phase deviation and modulation index, frequency deviation and percent modulation, Frequency analysis of angle modulated waves. Bandwidth requirements for Angle modulated waves.

**MODULE II: Band-pass Modulation Techniques [10 Periods]**
Introduction, Shannon limit for information capacity, digital amplitude modulation, frequency shift keying, FSK bit rate and baud, FSK transmitter, BW consideration of FSK, FSK receiver, phase shift keying – binary phase shift keying – QPSK, Quadrature Amplitude modulation, bandwidth efficiency, carrier recovery – squaring loop, Costasloop, DPSK.

**MODULE III: Base Band Transmission Techniques [10 Periods]**
A: Introduction, Pulse modulation, PCM – PCM sampling, sampling rate, signal to quantization noise rate, companding – analog and digital – percentage error,
B: delta modulation, adaptive delta modulation, differential pulse code modulation, pulse transmission – Intersymbol interference, eye patterns.

**MODULE IV: Spread Spectrum and Multiple Access Techniques [09 Periods]**
Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, processing gain, FH spread spectrum, multiple access techniques – wireless communication, TDMA and CDMA in wireless communication systems, source coding of speech for wireless communications.

**MODULE V: Satellite and Optical Communication [09 Periods]**

**TEXT BOOKS**

REFERENCES

E-RESOURCES
1. https://courses.engr.illinois.edu/ece458/comms2.pdf
3. http://nptel.ac.in/courses/117105131/

Course Outcomes:
At the end of the course, students will be able to
1. Understand fundamentals of analog communications
2. Understand different band-pass modulation schemes
3. Understand different base-band modulation schemes
4. Understand spread spectrum techniques and multiple access mechanisms
5. Get basic knowledge on satellite and optical communications

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Prerequisites: Basic Electrical and Electronics Engineering

Course Objectives:
The course aims to enable the student to visualize IC Fabrication steps and various IC technologies and to understand electrical properties of MOS, CMOS and Bi CMOS circuits.
The focus of the course is also on training the student to draw integrated circuit layouts following design rules. The course also helps the student to understand basic architectures of Data path subsystems, Application Specific Integrated Circuits, of CPLDs and FPGAs.

MODULE-I: IC Technologies & IC Fabrication [10 Periods]
IC Technologies – Review of Enhancement and Depletion MOS transistors, NMOS, PMOS & CMOS fabrications, Comparison of NMOS, CMOS & BiCMOS technologies.
IC Fabrication: Steps in Fabrication-Oxidation, Lithography, Diffusion, Ion implantation, Encapsulation and Metallization.

MODULE-II: Basic Electrical Parameters [10 Periods]
\( I_{ds}-V_{ds} \) relationships, MOS transistor threshold Voltage (Vt), transconductance\((g_m)\), output conductance\((g_{ds})\) & figure of merit. Pass transistor, NMOS Inverter, Determination of pull-up to pull-down ratios, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters, Latch-up in CMOS circuits.

MODULE-III: VLSI Circuit Design Processes [10 Periods]
A: VLSI Design Flow, MOS Layers, Stick Diagrams, Lambda based Design Rules and Layout, 2 \( \mu \)m CMOS Design rules for wires, Contacts and Transistors
B: Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits- Scaling models, Scaling function for device parameters, Limitations of Scaling.

MODULE-IV: Data Path Subsystems [09 Periods]
Data Path Subsystems: Subsystem Design – Barrel Shifter, Carry Select and Carry look Ahead Adder, Serial-Parallel and Braun Array Multiplier.

MODULE-V: ASIC’s and PLD’s [09 Periods]
Application Specific Integrated Circuits – Channel gate array, Channel less gate array and structured gate array.
Programmable Logic Devices - Architectures of CPLDs and FPGAs.

TEXT BOOKS:

REFERENCE BOOKS:

E-RESOURCES:
1. https://www.ece.uic.edu/~dutt/courses/ece565/lect-notes.html
5. http://nptel.ac.in/courses/117106093/
6. http://nptel.ac.in/courses/117101058/

Course Outcomes:
At the end of the course, students will be able to:
1. Understand the Enhancement and Depletion mode transistors and describe the steps involved in IC fabrication.
2. Understand the electrical properties of MOS and able to describe problem due to CMOS Latch up and the remedies for that.
3. Illustrate circuit diagrams, stick diagrams and layouts for NMOS, CMOS and BiCMOS circuits and the effects of Scaling.
4. Understand Basic architectures of Data path subsystems.
5. Understand Basic architectures of Application Specific Integrated Circuits, of CPLDs and FPGAs.

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Prerequisites:  NIL

Course Objectives:
This course enables the students to learn the basic concepts and the applications of Data Base Systems and conceptualize and depict a Data Base System using ER diagram, masterin constructing queries using SQL. Using this course student can understand relational database principles, become familiar with the basic issues of transaction processing and concurrency control and Data Base storage structures and access techniques.

MODULE I: Introduction:               [10 Periods]

Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises.

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design: ER to Relational, Introduction to Views, Destroying /Altering Tables and Views.

MODULE II: Relational Algebra and Calculus:  [9 Periods]
Preliminaries, Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
SQL: Queries, Constraints, Triggers: Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Triggers and Active Data bases, Designing Active Databases.

MODULE III: Schema Refinement and Normal Forms: [10 Periods]
A:Schema Refinement - Introduction to Schema Refinement, Functional Dependencies - Reasoning about FDs,

MODULE IV: Transaction Management and Concurrency Control [10 Periods]
**Concurrency Control:** Lock–Based Protocols, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes. Recovery System-Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with loss of nonvolatile storage, Early Lock Release and Logical Undo Operations, Remote Backup systems.

**MODULE V: Storage and Indexing**  
[09 Periods]


**Hash Based Indexing:** Static Hashing, Extendible hashing, Linear Hashing, Extendible vs. Linear Hashing.

**TEXT BOOKS**

**REFERENCES:**
5. Introduction to Database Systems, C. J. Date, Pearson Education.

**E-RESOURCES**
2. http://agce.sets.edu.in/cse/ebook/DBMS%20BY%20RAGHU%20RAMAKRISHAN

**Course Outcomes:**
At the end of the course, students will be able to

6. Identify the basic elements of a relational database management system and the data models for relevant problems.
7. Write SQL Queries by designing entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
8. Analyze various functional dependencies and apply normalization for designing a robust data base in the development of application software.

9. Implement transactions, concurrency control, recovery and Query optimization techniques.

10. Compare various indexing and hashing techniques.

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CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
PRE-REQUISITES: Databases, Programming fundamentals.

Course Objectives:
This course enables the students to learn and understand Big data, data analytics, R language, developing map reduce programs, discuss about concepts of big data, make use of Hadoop concepts for designing applications, develop applications using Hadoop I/O and analyze big data using programming tools such as Pig and Hive.

MODULE I: Big data overview, data analytics, and R Language [09 Periods]
Big Data Overview: Data Structures, Analyst Perspective on Data Repositories, State of the Practice in Analytics, BI Versus Data Science, Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics. Data Analytics Lifecycle, Model Building and Basic Data Analytic Methods Using R Data Analytics Lifecycle Overview, Key Roles for a Successful Analytics Project, Background and Overview of Data Analytics Lifecycle - Discovery, Data Preparation, Learning the Business Domain, Model Planning, Model building, Communicate Results, Operationalize and case study example Global Innovation Network and Analysis (GINA)

MODULE II: Working with Big Data [09 Periods]
Configuring of Hadoop Cluster - Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

MODULE III: Hadoop API and Map Reduce Programs [09 Periods]
A: Hadoop API - Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New)
B: MapReduce Programs with classes - Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner.

MODULE IV: Hadoop I/O and Implementation [09 Periods]
Implementation - Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators.
MODULE V: PIG and HIVE HADOOP TOOL [12 Periods]

PIG - HADOOP TOOL -  Hadoop Programming Made Easier - Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.


TEXT BOOKS

REFERENCES:
1. Alex Holmes, “Hadoop in Practice”, MANNING Publ.

E-RESOURCES

COURSE OUTCOMES:
At the end of the course, students will be able to
1. Develop simple applications using R language
2. Analyze file systems such as GFS and HDFS.
3. Design applications by applying Map reduce concepts.
4. Build up programs by making use of I/O.
5. Explore and inspect the big data using programming tools like Pig and Hive.

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CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Computer Networks

Course Objectives:
This course provides the students to gain knowledge in the cloud computing environment, security architecture and development of cloud services. Students will also examine the collaboration of real time cloud services and analyze the case studies from various cloud development tools.

**MODULE I: Introduction to Cloud Computing** [8 Periods]

**MODULE II: Virtualization** [12 Periods]
Virtual Machines and Virtualization of Clusters and Data Centers: Levels of Virtualization, Virtualization Structures//Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation.


**MODULE III: Cloud Computing Architecture over Virtualized Data Centers** [8 Periods]
A: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds.

**MODULE IV: Cloud Security** [8 Periods]
MODULE V: Cloud Programming and Standards          [12 Periods]

TEXT BOOKS

REFERENCES:

E-RESOURCES
2  https://www.thesisscientist.com/docs/Study%20Notes/8ad50655-64f5-46d4-bc89-0c02fefa132f
3  http://ndl.iitkgp.ac.in/document/zyMnqgZQXJCjME6wgSqrU87VCge10w5mZ-5ybmrhKBj79VQPP0_ZQHlqcOopPDoaFWhZybCrPg joTbBU8ZpGA
4  http://www.springer.com/computer/communication+networks/journal/13677
5  http://nptel.ac.in/courses/106106129/28
**Course Outcomes:**
At the end of the course, students will be able to
1. Understand the cloud enabling technologies and the Cloud service models.
2. Choose the levels of virtualization and tools for resource provisioning.
3. Compare the cloud platform architectures of virtualized data centers and Inter-cloud Resource Management.
4. Analyze the principles of Security and Trust management to protect confidentiality of data in the Cloud.

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Prerequisites: NIL

Course Objectives:
This course aims the students to learn the essentials of mobile apps development, aids in developing simple android applications, identify the essentials of android design, file settings, study about user interface design and develop android APIs.

MODULE I: Mobile and Information Architecture [10 Periods]

MODULE II: Introduction to Android and Installation [10 Periods]

MODULE III: Android Application Design and Settings [10 Periods]
B: Android File Settings - Android Manifest File and its common settings, Using Intent Filter, Permissions, Managing Application resources in a hierarchy, working with different types of resources.

MODULE IV: Android UID and Techniques [09 Periods]
Android User Interface Design - Essentials User Interface Screen elements, Designing User Interfaces with Layouts.

MODULE V: Android APIs-I & APIs-II [09 Periods]
Android APIs-I - Using Common Android APIs Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers.
Android APIs-II - Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.
TEXT BOOKS

REFERENCES
1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd.
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd.

E-RESOURCES
1. http://onlinevideolecture.com/ebooks/?subject=Android-Development
3. IEEE Transactions on Mobile Computing
4. International Journal of Interactive Mobile Technologies
5. http://nptel.ac.in/courses/106106147/

Course Outcomes
At the end of the course, students will be able to
1. Classify different types of Platforms.
2. Appreciate the Mobility landscape.
3. Familiarize with Mobile apps development aspects.
4. Design and develop mobile apps, using Android as development platform, with key focus on user experience design, native data handling and background tasks and notifications.
5. Perform testing, signing, packaging and distribution of mobile apps.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: NIL

Course Objectives:
This course enables the students to understand the fundamentals of python programming, describe the various operators and control flow statements, analyze various data structures, make use of functions, discuss about MODULE s, packages in python, object oriented concepts, exception handling, illustrate advanced concepts like multithreading, graphics and generate various test cases.

MODULE I: Python Programming-Introduction  [09 Periods]
Data Types - Variables, Assignment, Keywords, Input-Output, Indentation-Types - Integers, Strings, Booleans.

MODULE II: Operators and Expressions  [09 Periods]
Expressions - Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue.

MODULE III: Data Structures and Functions  [10 Periods]
A: Data Structures - Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions.

MODULE IV: MODULEs, Packages and Exception handling  [10 Periods]
MODULEs - Creating MODULE s, import statement, from. Import statement; name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor, Method, Inheritance, Overriding Methods, Data hiding.
Error and Exceptions - Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

MODULE V: Library functions and testing  [10 Periods]

Testing - Why testing is required?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

TEXT BOOKS

REFERENCES

E–RESOURCES

Course Outcomes
At the end of the course, students will be able to
6. Understand the basics of python programming languages
7. Illustrate simple programs with control structures
8. Apply advanced concepts like data structures and make use of functions.
9. Develop simple applications by using MODULE s, packages and exception handling mechanisms.
10. Demonstrate projects that make use of libraries and generate test cases for the projects.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
**Prerequisites:** Discrete Mathematics

**Course Objectives:**
This course enable the students to understand the basic fundamentals of Artificial Intelligence, determine various problem solving strategies, understand the logic concepts, different approaches to represent the knowledge, develop the expert systems in various phases and its applications, apply the fuzzy logic in various problem solving techniques.

**MODULE I: Introduction**
Introduction to Artificial Intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

**MODULE II: Problem Solving**
Problem reduction and game playing: Introduction, problem reduction, game playing, alphabeta pruning, two-player perfect information games.

**MODULE III: Logic Concepts and Knowledge Representation**
A: Logic Concepts - Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

**MODULE IV: Expert System and Applications**
Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems, blackboard systems truth maintenance systems, application of expert systems, list of shells and tools.

**MODULE V: Uncertainty Measure**
Probability theory: Introduction, Bayesian belief networks, certainty factor theory, dempster-shafer theory.
Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

TEXT BOOKS
1. Saroj Kaushik, “Artificial Intelligence”, CENGAGE Learning,
4. Patterson, “Introduction to Artificial Intelligence”, PHI

REFERENCES
2. Ertel, Wolf Gang, “Introduction to Artificial Intelligence”, Springer

E-RESOURCES
2. https://books.google.co.in/books?id=pVR9W5LEZUwC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
5. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7_M07uye_7zp_zRG3BvdUVy2Tl5ab45fveNjfyQsAbmBEGdSUqzidwcse6xwotJA
6. http://ndl.iitkgp.ac.in/document/xttk-4kfhvUwIxBW-YWRBg_vrHK12-lgOzTVb5oZ6eQOBjCWDfRvquHJLEOFEnjI5AmOqRc9Ar3eJF4CGFrw

Course Outcomes:
At the end of the course, students will be able to
1. Describe the key components of the Artificial Intelligence field.
2. Identify various problem solving strategies.
3. Construct the solution for the problem using various logic and knowledge representation techniques.
4. Interpret the knowledge in various domains using expert systems.
5. Discover the solutions by using the probability theory and fuzzy logic.

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Prerequisite: NIL

Course Objectives:
To understand the principles and mechanism of different drilling methods, novel drilling techniques. To learn the basic mechanism of rock fragmentation by blasting. To know the various types of explosives and accessories used in blasting. To learn the different methods of blasting adopted in surface and underground coal / non-coal mines including adverse effects of blasting & their control

MODULE-I: Principles of Drilling and Drill bits [10 Periods]
Principles of drilling: Principles of rock drilling, drill ability, drill ability index, factors affecting the drill ability, selection of drills.
Drill Bits: Various types of drill bits, study of bit life, factors affecting bit life, Thrust feed and rotation

MODULE-II: Explosives [10 Periods]
Historical development, properties of explosives, low and high explosives, ANFO, slurries, Emulsion explosives, heavy ANFO, permitted explosives, testing of permitted explosives, bulk explosive systems-PMS, SMS, substitutes for explosives and their applications- hydrox, cardox, airdox.

MODULE-III: Firing of Explosives and blasting methods [10 Periods]
A: Firing of Explosives: Safety fuse, detonating cord and accessories, detonators, Exploders, Electric firing and non-electric firing, electronic detonators, NONEL blasting.
B: Blasting methods: Preparation of charge, stemming and shot firing, choice and economical use of explosives, misfires, blown out shots, incomplete detonation, their causes, prevention and remedies.

MODULE-IV: Handling of Explosives [09 Periods]
Surface and underground transport of explosives, storage and handling of explosives, magazines, accidents due to explosives, precautions and safety measures during transportation.

MODULE-V: Mechanics of blasting and effects of blasting [09 Periods]
Effects of blasting: Vibrations due to blasting and damage criteria, fly rocks, dust, fumes, water pollution and controlled blasting.
TEXT BOOKS:

REFERENCES:
1. Rock blasting effect and operation, Roy Pijush Pal, A.A. Balkema, 1st ed, 2005
2. Elements of mining technology, Vol-1, D.J. Deshmukh, Central techno, 7th ed, 2001

E RESOURCES:
2. https://miningandblasting.wordpress.com/list-of-technical-papers/

Course Outcomes:
At the end of the course, students will be able to
1. Understand Principles of drilling and Various types of drill bits
2. Understand different types of Explosives
3. Understand Firing of Explosives and Blasting methods
4. Understand Handling of Explosives
5. Understand Mechanics of blasting and effects of blasting

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisite: Engineering Mechanics and strength of Materials

Course Objectives:
To introduce the basic principles in material handling and its equipment. To study the conveyor system and its advancement

MODULE-I: Bulk Handling Systems [10 Periods]
Basic principles in material handling exclusive to mining industry and its benefits. Classification of material handling equipments. Current state of art of bulk handling materials in mining in the world and Indian scenario; Selection of suitable types of systems for application. Stacking, blending, reclaiming and wagon loading, machinery and systems used at the stack yards; stock piles, silos, bunkers – their design, reclamation from them, various types of weigh bridges. Segregation - size wise and grade wise, Railway sidings.

MODULE-II: Short Conveyors and Haulage Systems [10 Periods]
Roller conveyor, overhead conveyor, screw conveyor, auger conveyor, apron feeder, bucket elevators, scraper haulage, conveyors in steep gradient, Armoured face conveyor, Off-highway Trucks, haul roads, In-pit crushers and modular conveyors, electric trolley assisted haulage, shuttle cars, skip hoist, winders, LHD’s, pneumatic conveying, hydraulic transport.

MODULE-III: Belt Conveyor System [09 Periods]
A: Design, capacity, calculations with respect to the size, speed, troughing, power requirement, tension requirement, belt selection, factor of safety. 
B: Developments in the design, of various components of belt conveyor systems such as; structures, rollers, gear boxes and motors, drums and pulleys, belting, ancillary components and safety gadgets.

MODULE-IV: New Types of Belt Conveyor Systems [09 Periods]
Curved conveyors, cable belts, pipe conveyors, rock belts – mine-run-rock conveyor, steel belt conveyors, steel slot conveyor, chain belt conveyors, etc., and other new developments, stackers and reclaimers, High Angle Conveyors (HAC); New inventions in HAC , Mobile or fixed installations; Woven wire belts, En Masse conveyor, Vibrating conveyor, gravity bucket conveyor.

MODULE-V: Material Handling in Mines, Plants and Workshops [10 Periods]
Mobile cranes, derrick cranes, pillar cranes, tower cranes, radial cranes, bridge cranes, fork lifters, overhead gantry material handling in workshops. Mineral handling in dimensional stone quarries, Mineral handling plants(coal, etc., ) Locomotives, rail tracks,
rail cars, railways wagons; Aerial ropeways, gravity ropeways; Containers and shipping; Rope haulage - different types.

TEXT BOOKS:

REFERENCES:

E RESOURCES:
1. www.bmt.org
2. www.canadianminingjournal.com/tag/material-handling/

Course Outcomes:
At the end of the course, students will be able to
1. Understand Basic principles in material handling exclusive to mining industry and its benefits
2. Understand Short Conveyors and Haulage Systems
3. Understand Belt Conveyor System
4. Understand New Types of Belt Conveyor Systems
5. Understand Material Handling in Mines, Plants and Workshops

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Prerequisites: NIL

Course objectives:
The course enables the students to be familiar with the recent developments in various technologies used in underground spaces includes tunneling and cavern projects across the world.

MODULE-I: Introduction [10 Periods]
Scope and application, historical developments, art of tunneling, tunnel engineering, future tunneling considerations. Types of Underground Excavations: Tunnel, adit,decline, shaft; parameters influencing location, shape and size; geological aspects; planning and site investigations.

MODULE-II: Tunnel Excavations [10 Periods]
Tunneling Methods: Types and purpose of tunnels; factors affecting choice of excavation technique; Methods - soft ground tunneling, hard rock tunneling, shallow tunneling, deep tunneling; Shallow tunnels – cut and cover, cover and cut, pipe jacking, jacked box excavation techniques, methods of muck disposal, supporting, problems encountered and remedial measures.

MODULE-III: Drilling and Blasting [10 Periods]
A:Drilling - drilling principles, drilling equipment, drill selection, specific drilling, rock drillability factors; Blasting - explosives, initiators, blasting mechanics
B:Types of cuts- fan, wedge and others; blast design, tunnel blast performance - powder factor, parameters influencing, models for prediction; mucking and transportation equipment selection.

MODULE-IV: Mechanization [09 Periods]
MODULE-V: Tunnel Services [09 Periods]
Supports in Tunnels: Principal types of supports and applicability. Ground Treatment in Tunneling: Adverse ground conditions and its effect on tunneling; Excavation of large and deep tunnels, caverns. Tunnel Services: Ventilation, drainage and pumping; Tunneling hazards.

TEXT BOOKS:

REFERENCES:

E RESOURCES:
1. www.cowi.com/.../bridgetunnelandmarinestructures/tunnels/.../021-1700-020e-10b_
2. https://miningandblasting.wordpress.com/list-of-technical-papers/

Course Outcomes:
At the end of the course, students will be able to
1. Understand art of tunneling, tunnel engineering, future tunneling considerations
2. Understand different types Tunneling Methods
3. Understand drilling principles, drilling equipment, explosives, initiators, blasting mechanics
4. Understand tunneling by different machines
5. Understand Tunnel Services

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
ENGLISH LANGUAGE SKILLS
(Open Elective)

Credits: 3

Prerequisites: Nil

Course Objective:
To build business English vocabulary and grammar through lessons on the latest topics in the business world and to upgrade the learners communication and presentation skills and make the students competent in communication at an advanced level. In addition to the earlier mentioned, this course gives a room to groom the learners’ personality and make the students self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills by giving hands-on experience about business presentations and attending team meetings.

Module – I: Communication Skills [10 Periods]
Types of communication-Oral, aural and written, reading-Word Power-Vocabulary-technical vocabulary, Rate of speech- pitch, tone-clarity of voice.

Module – II: Conversation Skills [10 Periods]
Informal and Formal conversation, Verbal and Non-verbal communication. Barriers to effective communication - Kinesics

Module – III: Reading Skills [10 Periods]
A: Types of reading—reading for facts, guessing meaning from context.
B: Strategies of reading- scanning, skimming, inferring meaning, critical reading.

Module – IV: Creative Writing [10 Periods]
Letter-writing-business letters-pro forma culture-format-style-effectiveness, promptness-Analysis of sample letters collected from industry-email, fax, Essay writing-nuances of essay writing, types of essays,

Module - V: Writing Skills [10 Periods]

REFERENCES:
4. Raymond V. Lesikav; John D. Pettit Jr.; Business Communication: Theory & application, All India Traveler Bookseller, New Delhi-51

E Resources
3. http://lrs.ed.uiuc.edu/students/jblanton/read/readingdef.htm (Reading Skills)
6. https://www.youtube.com/watch?v=cQruENyLNYI&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH (Communication Skills)

Course Outcomes:
At the end of the course, students will be able to
1. Understand the importance of various forms of non-verbal communication.
2. Participate confidently in business meetings.
3. Gain an understanding about different types of reading skills and employ the same during competitive exams.
4. Recognize the importance of writing in real time situations.
5. Improve the skills necessary to meet the challenge of using English in the business world.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisites: NIL

Course Objectives:
To determine how well the students can develop a compelling argument in writing for an academic audience. Further helps them to involve in critical thinking and persuasive writing exercises. This course also intends to develop effective writing skills to analyze and evaluate the data and ideas for better comprehension. On the other hand this course encourages students to learn strategies for becoming accurate readers and critical analysts.

Module – I: Interpretation and Types of Reading [10 Periods]
- Interpretation in different settings
- Understanding the main ideas in the text
- Reading for inference
- Reading for theme
- Reading for interpretation

Module –II: Approaches to Reading [10 Periods]
- Biographical
- Historical
- Gender
- Sociological

Module – III: Critical Reading [10 Periods]
- The Theme
- Setting
- Point of View
- Characters
- Plot
- Analysis
- Interpretation

Note: This module should be dealt with reference to Animal Farm by George Orwell

Module - IV: Analytical Writing [09 Periods]
- Argumentation
- Sequencing
- Analyze an ISSUE
- Analyze an Argument
- Verbal Reasoning
• Interpretive Reports

**Note:** This module should be dealt with reference to Essays written by Somerset Maugham/Russell/Aldous Huxley

**Module – V: Creative Writing**

- Figurative Language
- Imagery
- Writing a short Poem
- Writing a short Story

**REFERENCES:**
1. GRE by CliffsTestPrep-7th edition
2. GRE Exam- A Comprehensive Program
3. M H Abraham *Glossary of English Literary terms*
4. GD Barche *Interpreting Literature- A Myth and a Reality*
5. Wilbur Scott- *Five approaches to literary criticism.*

**E Resources:**
1. [http://www.brad.ac.uk/staff/pkkornakov/META.htm](http://www.brad.ac.uk/staff/pkkornakov/META.htm) (Introduction to Interpretation Skills)
2. [http://literacyonline.tki.org.nz/Literacy-Online/Planning-for-my-students-needs/Effective-Literacy-Practice-Years-1-4/Approaches-to-teaching-reading](http://literacyonline.tki.org.nz/Literacy-Online/Planning-for-my-students-needs/Effective-Literacy-Practice-Years-1-4/Approaches-to-teaching-reading) (Approaches to Reading)
4. [https://www.ets.org/gre/revised_general/about/content/analytical_writing](https://www.ets.org/gre/revised_general/about/content/analytical_writing) (Analytical Writing)

**Course Outcomes:**
At the end of the course, students will be able to:
1. Think critically and help in writing analytically.
2. Get real life experiences through interpretation of literature.
3. Learn strategies for becoming accurate readers and critical analysts.
4. Think logically towards social, political, economical, legal and technological issues.
5. Draw their career vision and mission independently.

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**CO- PO, PSO Mapping**
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
2018-19
Onwards
(MR-18)

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

B.Tech.

Code: 80H09
ENGLISH FOR ACADEMIC AND RESEARCH WRITING
(Open Elective)
Credits: 3

Prerequisites: NIL
Course Objectives:
This paper helps the students use pre-writing strategies to plan writing. Further it improves writing through the process of drafting essays, reports, abstracts, etc. In addition to this, it improves accuracy and complexity of Sentence structure in academic writing. On the other hand the student will be able to analyze and interpret data. This course also intends to develop research skills to identify and incorporate relevant resources for research writing.

Module I  Features of Academic writing  [09 periods]
Language: Clear, Correct, Concise, Inclusive language
Tone: Formal, Objective, Impersonal, Cautious tone
Style: Appropriate, Accurate, Organized, Empirical style
Ethics: Honesty, Integrity, Responsibility, Accountability

Module II  Kinds of Academic writing  [09 periods]
Essays, Reports, Reviews, SOPs, Abstracts, Proposals

Module III  Academic Writing Skills  [10 periods]
❖ Paraphrasing
❖ Summarizing
❖ Quoting
❖ Rewriting
❖ Expansion

Module IV  Research Process  [09 periods]
Selection of Topic, Formulation of Hypothesis, Collection of Data, Analysis of Data, Interpretation of Data, Presentation of Data

Module V  Structure of a Research Document  [09 periods]
Title, Abstract, Introduction, Literature Survey, Methodology, Discussion, Findings/Results, Conclusion, Documenting Sources

REFERENCES:

E RESOURCES:
2. https://brians.wsu.edu/common-errors/
4. http://nptel.ac.in/courses/109106094/26 (Academic Writing and Linking Words)

Course Outcomes:
At the end of the course, students will be able to:
1. Write effective and appropriate introduction and conclusion.

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(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2. Use a wide range of academic words correctly and appropriately.
3. Write a variety of effective sentences that contain appropriate cohesive devices, connectors and transition words.
4. Identify relevant outside source material and integrate it appropriately in writing.
5. Find out results and draw conclusions for research documentation.
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Prerequisite: NIL

Course Objectives:
The objective of this course is to introduce various numerical techniques which are indispensable tools to solve many algebraic and transcendental equations. Various methods are used to reduce the global error involved in approximations. This course fills into this perceived need. The treatment should be informed by the fact that not only conceptual but also (and in some cases) more importantly numerical or computational methods are of essence.

Module I: Algebraic and Transcendental Equations [09 periods]

Module II: Interpolation [10 periods]
Introduction, Errors in Polynomial Interpolation, Finite differences, Forward Differences-Backward differences, Symbolic relations and separation of symbols, Differences of a polynomial-Newton’s formulae for interpolation Central difference interpolation Formulae, Gauss Central Difference Formulae, Interpolation with unevenly spaced points: Lagrange’s Interpolation formula.

Module III: Curve fitting, Numerical Differentiation & Integration [10 periods]
A: Curve fitting: Fitting a first degree (linear) and second degree (parabola), exponential, power curves for a data by the Method of least squares.

Module IV: Numerical solution of Ordinary Differential Equations [10 periods]

Module V: Numerical Solution of Partial Differential Equations [09 periods]
Classification of second order equations – Finite difference approximations to derivatives - standard 5 point formula – diagonal 5 point formula – solution of Laplace equation.
Solution of poisson’s equation. Solution of one dimensional heat, wave equations (by Crank-Nicolson explicit/implicit formula only).

TEXT BOOKS:

REFERENCES:

E RESOURCES:

Course Outcomes:
At the end of the course, students will be able to:
1. Apply numerical methods to solve some algebraic and transcendental equations to the desired level of accuracy.
2. Application of interpolation concept to evaluate missed data in data analysis.
3. Application of least squares method to solve data analysis problems and able to find the differentiation and integration by using numerical techniques.
4. Apply differential equations in engineering oriented problems and to observe patterns by using numerical techniques.
5. To find out the Numerical solution of partial differential equations.
CO- PO Mapping  
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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Prerequisite: Basic concepts of statistics

Course Objectives:
Uncertainty is found everywhere. It is therefore essential to understand the techniques for handling and modeling it. This course is meant to provide a grounding in Statistics and foundational concepts that can be applied in modeling processes and decision making. These would come in handy for the prospective engineers in most branches.

Module - I: Analysis of Variance & Analysis of Co-variance [10 periods]

Module - II: Design of Experiments [10 periods]
Latin Square Design (L.S.D) including one missing observation, expectation of various sum of squares. Introduction to Factorial design - $2^2$ and $2^n$ Factorial design. Analysis of Co-variance (ANCOVA) (Only one way). Conducting ANCOVA – Two way Comparison of the efficiencies of above designs.

Module - III: Statistical Quality Control [10 periods]
A:Importance of SQC in industry. Statistical basis of Shewart control charts. Construction of control charts for variables (mean,range and standard deviation) and attributes (p,np,c&d charts with fixed and varying sample sizes).
B:Interpretation of control charts. Natural tolerance limits and specification limits process capability index. Concept of Six sigma and its importance, Single and double sampling plans.

Module - IV: Multiple Regression &Time Series [09 periods]
Multiple Regression for n- independent variables.
Time Series : Fitting a trend line to a time series, Method of least Squares and Method of Moving Averages, Measure of Seasonal Variation.

Module - V: Queuing Theory [09 periods]
Structure of a queuing system, Operating Characteristics of queuing system, Transient and Steady states, Terminology of Queuing systems, Arrival and service processes, Pure Birth-Death process Deterministic queuing models, (M/M/1):(∞:FIFO) Model, (M/M/1):(N:FIFO) Model.
TEXT BOOKS:

REFERENCES:

E RESOURCES
1. https://onlinecourses.science.psu.edu/stat502/node/183 (ANCOVA)
2. http://www.uoguelph.ca/~dsparlin/sqc.htm (StatisticalQualitycontrol)
3. http://irh.inf.unideb.hu/~jsztrik/education/16/SOR_Main_Angol.pdf (Basic Queueing Theory)
5. http://nptel.ac.in/courses/110106064/5 (Introduction to Data Analysis)
6. http://nptel.ac.in/courses/111104075/ (ANOVA and Design of Experiments)

Course Outcomes:
At the end of the course, students will be able to:
1. Perform Analysis of variance, ANCOVA and design of experiments in manufacturing firms.
2. Advanced design of experiments and their applications.
3. The students will learn the concept of quality control, Six Sigma and its importance to real life problems.
4. The student will be able to understand the concept of Multiple regression and Application of Time-series,
5. The students would be able to find the expected queue length, the ideal time, the traffic intensity and the waiting time. These are very useful tools in many engineering and data management problems in the industry. It is useful for all branches of engineering.

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CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
**Prerequisites:** Basic concepts of Linear Programming

**Course Objectives:** This course deals with the extremely important topics under the broad umbrella of optimization. This is synonymous with efficiency which is the underlying prime rationale for all scientific and technological advances and progress.

**MODULE - I: Introduction and Basic Concepts of Optimization**  [10 Periods]
Historical Development; Engineering applications of Optimization; Art of Modeling - Objective function; Constraints and Constraint surface; Formulation of design problems as mathematical programming problems.

**MODULE - II: Optimization using Calculus**  [9 Periods]
Classification of optimization problems Optimization techniques – classical and advanced techniques. Stationary points; Functions of single and two variables; Global Optimum - Convexity and concavity of functions of one and two variables - Optimization of function of one variable and multiple variables; Gradient vectors;

**MODULE - III: Linear Programming Applications**  [10 Periods]
A: Optimization of function of multiple variables subject to equality constraints; Lagrangian function Optimization of function of multiple variables subject to equality constraints.
B: Hessian matrix formulation; Eigen values Kuhn-Tucker Conditions; Post optimality analysis - Other algorithms for solving LP problems – Karmarkar’s projective scaling method

**MODULE – IV: Dynamic Programming**  [10 Periods]
Sequential optimization; Representation of multistage decision process; Types of multistage decision problems; Concept of sub optimization and the principle of optimality - Recursive equations – Forward and backward recursions; Computational procedure in dynamic programming (DP)

**MODULE – V: Applications of Dynamic Programming**  [9 Periods]
Problem formulation and application in Design of continuous beam and Optimal geometric layout of a truss - Water allocation as a sequential process - Capacity expansion and Reservoir operation

**TEXT BOOKS**

**REFERENCES:**

E-RESOURCES
3. http://shodhganga.inflibnet.ac.in/bitstream/10603/19544/12/7_chapter%201.pdf

Course Outcomes:
At the end of the course, students will be able to:
1. Understand the historical development of OR and formulate the design problems.
2. Find the optimum values using calculus.
3. Apply the linear programming techniques to solve the engineering problems.
4. Know the various concepts of Dynamic Programming.
5. Apply the Dynamic Programming techniques to solve the engineering problems.

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CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: NIL

Course Objectives:
The objective of this course is to make the students familiar with the recent advanced concepts in physics

Module I: Special Theory of Relativity: [09 Periods]
Introduction, Concept of theory of relativity, Frames of reference-Inertial, non-inertial; Galilean transformation equations, Michelson-Morley experiment, Einstein theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity, Relativistic relation between energy and momentum.

Module II: Holography [09 Periods]

Module III: Thin films Synthesis and Characterization [06 Periods]
A: Synthesis - Introduction, Deposition techniques-Pulsed Laser Deposition (PLD), Spray Pyrolysis; Nucleation and growth of the thin films, properties (Mechanical, Electrical, Magnetic and Optical).
B: Characterization [06 Periods]

Module IV: Photonic Crystals [09 Periods]
Important features of photonic crystals, Presence of photonic band gap, anomalous group velocity dispersion, Micro cavity, effects in Photonic Crystals, fabrication of photonic Crystals, Dielectric mirrors and interference filters, PBC based LEDs, Photonic crystal fibers (PCFs), Photonic crystal sensing.

Module V: Solar cell Physics [09 Periods]
Single, poly and amorphous silicon, GaAs, CdS, Cu2S, CdTe; Origin of photovoltaic effect, Homo and hetero junction, working principle of solar cell, Evaluation of Solar cell parameters, I-V, C-V and C-f characteristics.

TEXT BOOKS:

REFERENCES:

E-RESOURCES:
6. http://nptel.ac.in/courses/115101011/
7. http://nptel.ac.in/courses/117103066/11

Course Outcomes:
At the end of the course, students will be able to:
1. be aware of the concepts of special theory of relativity.
2. Analyze the basic concepts of Holography and applications.
3. Acquire the knowledge on synthesis methods of thin films and their characterization techniques.
4. Develop basic knowledge on the photonic crystals
5. Apply the basic concepts of solar cell physics.

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Prerequisites: Engineering Physics

Course Objectives:
The objective is to provide different methods of synthesis and characterization of nano materials.

Module I: Physical Methods [09 periods]
Bottom-up approach and Top-down approach, Inert gas condensation, Arc Discharge, lasers ablation, laser pyrolysis, ball milling, molecular beam epitaxial, and electro deposition.

Module II: Chemical methods [08 periods]
Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis, Nano crystals of semiconductors.

Module III: Thermal Methods & Surface Characterization
A: Thermal Methods: [07 periods]
Thermolysis route – spray pyrolysis and solved metal atom dispersion, sol-gel method solvothermal and hydrothermal routes, solution combustion synthesis, CVD method.

B: Surface Characterization [07 periods]
Scanning electron microscopy (SEM), Transmission electron microscopy (TEM). Photo luminescence Spectroscopy.

Module IV: Compositional and structural Characterization techniques [09 periods]

Module V: Properties and Applications of Nano materials [08 periods]
Carbon Nano Tube (CNT) – Single-Wall Carbon Nano Tube (SWCNT), Multi-wall carbon Nano tube (MWCNT), Activated carbon, Fullerene, Graphene, Quantum wire and Quantum dots

TEXT BOOKS:
REFERENCES:

E-RESOURCES:
4. https://www.journals.elsevier.com/nanoimpact
6. http://nptel.ac.in/courses/118104008/
7. http://nptel.ac.in/courses/118102003/

Course Outcomes:
At the end of the course, students will be able to:
1. be aware of different physical methods of synthesis of nano materials.
2. be aware of different chemical methods of synthesis of nano materials.
3. Understand different thermal methods of synthesis of nano materials and to learn different surface characterization techniques.
4. acquire the the different compositional and structural characterization techniques.
5. develop basic knowledge on the properties and applications of few nano

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CO – PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Engineering Physics

Course Objectives:
The objective is to provide a basic level of understanding on Non-destructive testing and Vacuum technology.

Module I: Introduction to Non destructive testing [06 periods]
Introduction, Objectives of Non destructive testing, Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage.

Module II: Methods of Non destructive Testing [09 Periods]
Liquid penetration method, Dye penetration method, Radiographic testing, Ultrasonic Inspection method, Pulse Echo method, Magnetic particle testing, Eddy current Testing.

Module III: Introduction to Vacuum Technology and Flow meters
A: Introduction to Vacuum Technology [09 Periods]
Definition of vacuum, Degrees of vacuum and their ranges; Review of Kinetic theory of gases; Definitions of particle flux, mono layer formation time, pressure; Elementary gas transport phenomena; Knudsen’s and Reynolds’ numbers; Throughput, mass flow and conductance;

B: Flow meters [07 Periods]
Molar flow, Mass flow and throughput; Rota meters and chokes; differential pressure techniques;

Module IV: Pressure gauges [08 Periods]
Classification, Direct and indirect gauges, Indirect gauges – Pirani gauge, Thermocouple gauge, Ionization gauge, hot cathode gauge, Penning gauge

Module V: Vacuum Pumps [09 Periods]
Introduction, Pumping speed, Rotary vane pump, Turbo molecular pump, Diffusion pumps

TEXT BOOKS:

REFERENCES:

E-RESOURCES:
5. https://www.journals.elsevier.com/vacuum
7. http://nptel.ac.in/courses/112101004/37

Course Outcomes:
At the end of the course, students will be able to:
1. aware of the concepts of NDT
2. Understand different methods of NDT,
3. Analyze Vacuum technology and concepts of flow meters.
4. Develop pressure gauges.
5. Understand the concepts of different vacuum pumps

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_CO – PO Mapping_ (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak
Prerequisites: Nil

Course Objectives:
The objective is to make the students know about the concept of phase rule and alloys, phase diagrams of different systems. To give knowledge to the students regarding liquid crystals, abrasives, glass, ceramics, refractories, colloids and adhesives. To make the students for understand the basic concepts of chemistry to develop futuristic materials for high-tech. applications in the area of engineering.

MODULE I: Phase Rule and alloys  
[10 Periods]
Phase Rule: Definition of terms: Phase, component, degree of freedom, phase rule equation. Phase diagrams-one component system-water system. Two component system Lead-Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization. Introduction to alloys-fabrication of alloys-ferrous alloys-nonferrous alloys-industrial applications.

MODULE II: Composites, Abrasives and Adhesives  
[10 Periods]

MODULE III: Cement and Concrete  
[10 Periods]
B: Concretes-pre stressed concrete-post tensioning-curing-overall scenario of cement industry-Reinforced concrete, constructions-testing and decaying of cement-prevention of cement decay.

MODULE IV: Glass, Ceramics and Refractories  
[09 Periods]
MODULE V: Colloids and surfactants [09 Periods]


TEXT BOOKS:

REFERENCES:

E-RESOURCES:
1. www.istl.org/02-spring/internet.html (Basics on materials)
3. Journal of materials science (Springer publishers)
4. Journal of materials science and technology (Elsevier publishers)
5. npTEL.ac.in/courses/105102012/ (Cement concrete technology)

Course Outcomes:
At the end of the course, students will be able to:
1. Interpret the vitality of phase rule in metallurgy and application of phase rule to one and two component systems.
2. Understand the concepts of abrasives, adhesives and liquid.
3. The immense importance of basic constructional material, Portland cement in Civil Engineering works.
4. To acquire the knowledge about properties and applications of glass, ceramics and refractories.
5. Understand the relationships between macroscopic material properties and microscopic structures.
## CO-PO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

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**Prerequisites:** NIL

**Course Objectives:**

The objective is to make the learners know about the scope of nano scale materials and their versatile properties. To give knowledge of various instrumental techniques to the analysis the nano materials. To make aware of the learners of different applications of nano materials.

**MODULE I : Nanochemistry-I**  
[09 Periods]
Introduction -synthesis of nanostructure materials, Bottom-up approach and Top-down approach with examples-sol-gel method-solvothermal and hydrothermal routes, Chemical Vapor Deposition and precipitation methods.

**MODULE II: Nanochemistry-II**  
[10 Periods]

**MODULE III: Instrumental Analysis**  
[10 Periods]
B: Transmission Electron Microscopy (TEM), Dynamic Light Scattering (DLS) and Atomic Force Microscopy (AFM) -Illustrative examples.

**MODULE IV: Carbon Nanotubes and Application**  
[10 Periods]

**MODULE V: Environmental Nanotechnology**  
[09 Periods]
Implications of Nanotechnology & Research needs-Nanostructured Catalysts TiO₂ Nanoparticles for Water purification- Nano membranes in drinking water treatment and

TEXT BOOKS:

REFERENCES:

E- RESOURCES:
1. www.docbrown.info/page03/nanochem02.htm (Nanochemistry applications)
2. https://books.google.co.in/books?isbn=352732626X (concepts of nanochemistry)
3. Journal of nanostructure in chemistry (springer publishers)
4. Nanochemistry (wiley publishers)
5. nptel.ac.in/courses/118104008/6 (Introduction to nanomaterials)
6. nptel.ac.in/courses/118104008/ (Nanostructures and nanomaterials)

Course Outcomes:
At the end of the course, students will be able to:
1. Students will learn the different synthetic methods of the nanomaterials.
2. To know the student Electronic, optical and magnetic properties of nanomaterials.
3. To acquire the knowledge various instrumental methods of analysis (TEM, EDS, SEM, DLS & AFM).

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4. The students can come to know the carbon nanotubes, carbon nanofibers, nanostructured catalysts and organic nanosolar cells.
5. Students will learn usage of nanomaterials in the purification of water.

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Prerequisites: NIL

Course Objectives:
The subject provides an introduction to polymer science along with the synthesis of macromolecules by step-growth and chain-growth polymerization. Compounding of polymers and different fabrications methods are discussed. Molecular weight determination of polymers is shown using gel permeation chromatography. An overview of biodegradable and conducting polymers is also given.

**MODULE I: Introduction to Polymer Chemistry**

Definitions-Origin, Monomers and its requirements - Broad classification of polymers- types based on structure (homo & copolymers), processing (thermo plastics & thermosetting plastics) and applications. Molecular force and chemical bonding in polymers - tacticity. Determination of molecular weight (MW)-methods for number average- weight average- PDI( poly dispersity index)-effect of polymerization on PDI. Distribution and processing of polymers using Tg& Tm.

**MODULE II: Polymerization mechanism**


**MODULE III: Compounding of Polymers & fabrication methods**
A: Introduction—compounding of polymers and their functions, selection of additives (by function), improving/modifying the mechanical properties.

B: Fabrication of plastics by compression, injection, transfer, extrusion—moulding, blowing and thermoforming methods.

**MODULE IV: Characterization techniques**

[10 Periods]

Molecular mass by Gel permeation chromatography, Molecular structure by X-ray diffraction, Morphology of polymer using –Scanning Electron Microscopy, Thermal stability using Thermogravimetric analysis (TGA).

**MODULE V: Biodegradable polymers and conducting polymers**

[09 Periods]


**TEXT BOOKS:**


**REFERENCES:**


**E- RESOURCES:**

2. file:///C:/Users/Admin/Downloads/polymer-science-and-technology.pdf(polymer science and technology)
3. European polymer journal (Elsevier publishers)
4. Journal of polymer research (Springer publishers)
5. http://nptel.ac.in/courses/104105039/ (Polymer chemistry)
6. http://nptel.ac.in/courses/113105028/ (Polymers)
Course Outcomes:
At the end of the course, students will be able to:
1. Analyse different mechanisms of polymer formation and use this information in the synthesis of different polymers.
2. Evaluate the effect of factors such as polymer structure, molecular weight, branching and diluents on crystallinity.
3. Interpret experimental data and determine the structure of polymers by different techniques.
4. Assess the compounding of polymers & fabrication methods.
5. To know the student importance of biodegradable and conduction polymers.

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CO- PO, PSO Mapping
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