ACADEMIC REGULATIONS & CURRICULUM

Applicable to the students admitted from the Academic Year 2020-2021

COMPUTER SCIENCE AND ENGINEERING & INFORMATION TECHNOLOGY
(B.Tech. Programme)

MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING
(Autonomous)

(Approved by AICTE, New Delhi, and permanently affiliated to JNTUK, Kakinada)
Listed u/s 2(f) & 12(B) of UGC Act 1956,
Vijayaram Nagar Campus, Chintalavalasa, Vizianagaram-535005, Andhra Pradesh
The visionaries

Late Dr. P V G Raju
Raja Saheb of Vizianagaram
Founder Chairman-MANSAS
Ex-Minister for Education and Health, Govt. of AP
Ex Member of Parliament

Late Dr. P. Anand Gajapathi Raju
Ex-Chairman-MANSAS
Ex-Minister for Education and Health
Govt. of AP
Ex Member of Parliament

P. Ashok Gajapathi Raju
Chairman-MANSAS
Ex-Union Minister for Civil Aviation,
Govt. of India
Ex-Minister for Finance, Govt. of AP
Vision

Maharaj Vijayaram Gajapathi Raj College of Engineering strives to become a centre par excellence for technical education where aspiring students can be transformed into skilled and well-rounded professionals with strong understanding of fundamentals, a flair for responsible innovation in engineering practical solutions applying the fundamentals, and confidence and poise to meet the challenges in their chosen professional spheres.

Mission

The management believes imparting quality education in an atmosphere that motivates learning as a social obligation which we owe to the students, their parents/guardians and society at large and hence the effort is to leave no stone unturned in providing the same with all sincerity. Towards that end, the management believes special focus has to be on the following areas:

M1: Have on-board staff with high quality experience and continuously updating themselves with latest research developments and sharing that knowledge with students.

M2: Having a well stream-lined teaching learning process that is continuously assessed for effectiveness and fine-tuned for improvement.

M3: Having state-of-the-art lab and general infrastructure that gives students the necessary tools and means to enhance their knowledge and understanding.

M4: Having a centralized department focused on improving placement opportunities for our students directly on campus and coordinating the training programs for students to complement the curriculum and enhance their career opportunities.

M5: Having advanced research facilities and more importantly atmosphere to encourage students to pursue self-learning on advanced topics and conduct research.
ABOUT THE INSTITUTION:

Maharajah Alak Narayan Society of Arts and Science (MANSAS) is an Educational Trust founded by Dr. (late) P.V.G Raju, Raja Saheb of Vizianagaram in the hallowed memory of his father Maharajah Alak Narayan Gajapati with a view to confound socio-economic inequalities in the Vizianagaram principality executing a trust deed on 12-11-1958 duly established Maharajah’s College and other educational institutions in and around Vizianagaram. The Trust is a charitable one published under Section 6 a (1) of A.P Charitable and Hindu Religious Institutions and Endowment Act 30 of 1987.

The object of the Trust is to manage the properties of educational institutions under it and to promote and advance the cause of education in general, besides awarding scholarships to deserving students enabling them to undergo special training in science and industries in and out of India. The Trust has made an uncompromising contribution to the nation by presenting the stalwarts.

Trust offers KG to PhD level education in Arts, Sciences, Law, Pharmacy, Humanities Education, Engineering and Management and presently houses 13 Educational Institutions. MVGR College of Engineering is one of the 13 Institutes.

Other Institutions under MANSAS

1. M.R. HIGH SCHOOL 1857
2. M.R COLLEGE (NAAC ACCREDITED) 1879
3. M.R. COLLEGE OF EDUCATION 1950
4. M.R. WOMENS COLLEGE (NAAC ACCREDITED) 1962
5. M.R. GIRLS HIGH SCHOOL 1974
7. M.R. ENGLISH MEDIUM SCHOOL 1979
12. M.R. COLLEGE OF PHARMACY 2004
Maharaj Vijayaram Gajapathi Raj (MVGR) College of Engineering was established in the year 1997 by Maharaj Alak Narayan Society for Arts and Sciences (MANSAS) to impart quality technical education. The Institution is located in lush green, serene and pollution free environment spread over 60 acres of land in Chintalavalasa village situated in the outskirts of Vizianagaram, a fort city in the north coastal region of Andhra Pradesh.

Institution at a glance:
- MVGR is a 23 years old institution, established in 1997
- All eligible UG Programs (CHEMICAL, CIV, CSE, ECE, EEE, IT & MECHANICAL) were reaccredited by NBA.
- MBA program was also re-accredited by NBA.
- Had been re-accredited with Grade ‘A’ by NAAC of UGC
- Has Permanent affiliation with JN Technological University-Kakinada
- Listed under sections 2(f) & 12(b) of UGC act 1956.
- Approved by AICTE-New Delhi
- Eight departments are recognized as RESEARCH CENTERS by JNTU-K
- Granted Autonomy by UGC in 2015
- Campus of 60 acre
- Offering 7 UG and 5 M.Tech., and 1 MBA program
- About 250 faculty of which 84 Ph.D. Degree holders
- 83 Laboratories with an investment of about 13 Crores
- Total built up area of about 7 Lakh Sft
- About 42,000 volumes and Access to 8 international online journal packages like IEEE, SPRINGER, etc.
- 1420 Systems & 395 Mbps band width internet facility
- About Rs. 4 Crore worth of on-going R&D projects
- Actively involved in civil engineering consultancy work as Third Party Quality Auditor for Vizianagaram Municipality
- WIPRO Recognized technology learning center and MISSION 10X partner institution
- Recognized National Instruments Academy for Training in LabView
- SIRO Recognition by DSIR
- Recognized PTC Centre of Excellence for Creo Training
- Identified by MSME as Business Incubation Centre
- APSSDC-Siemens Technical Skill Development Institute
- Recognized CMs SKILL EXCELLENCY CENTER (SEC)
- Microsoft Ed-vantage Platinum Partner
- Institutional member of IUCEE
- Institutional Member of CII
- Member, Chamber of Commerce, Vizianagaram
- Green Campus award by Govt. of AP
MVGR College of Engineering is rated as one among the best engineering colleges in the state of Andhra Pradesh as it set up highest standards in all areas of curricular, co-curricular and extra-curricular activities and in students’ placements. Based on industry and expert’s feedback, the college is updating the curriculum from time to time. The college offers many value added add-on courses students and conducts training programs to meet the industries’ requirements.

**Academic Regulations for B.Tech., Program**

Applicable to the students admitted from the Academic year 2020-2021 onwards.

1. **PROGRAM STRUCTURE:**

**B.Tech.:**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Category</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Humanities and Social Sciences including Management courses</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Basic Science courses</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>Professional core courses</td>
<td>54</td>
</tr>
<tr>
<td>5</td>
<td>Professional Elective courses relevant to chosen specialization/branch</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>Open subjects – Electives from other technical and/or emerging subjects</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>Project work, seminar and internship in industry or elsewhere</td>
<td>13</td>
</tr>
<tr>
<td>8</td>
<td>Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>160</strong></td>
</tr>
</tbody>
</table>

- Open electives offered by the parent department are listed in the course structure and are offered to students of other programs. The students of parent departments may also opt the course, provided it shall not be listed in the curriculum.

- For audit course a student is deemed to satisfy the minimum contact hours, as prescribed by the department and shall also comply with the requirements for submission of assignments/projects. A student shall also opt for MOOCs and submit the certificate.
### 1. HSS Courses

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>English -I</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>English -2 (Technical English)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Elective-1 (Management Related course (MEFA or MS or Operations Research))</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Elective-2 (Professional Ethics and Human Values)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

### 2. Basic Science Courses

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mathematics-I</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Mathematics-II</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Mathematics-III</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Mathematics-IV</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Applied / Engineering Physics</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Applied / Engineering Physics Lab</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Engineering Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Engineering Chemistry Lab</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Biology for Engineers</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

### 3. Engineering Science Courses

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Programming for Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Programming for Problem Solving Lab</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Internet of Things (IOT)</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Computer aided Engineering Graphics</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Basic Electrical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Basic Electrical Engineering Lab</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Department wise Engineering Science Course-I AI Tools, Techniques &amp; Applications</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>AI Tools, Techniques &amp; Applications Lab</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Department wise Engineering Science Course-II (Design thinking and Product Innovation)</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Workshop (Department Specific)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>26</strong></td>
</tr>
</tbody>
</table>

### Subjects

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Professional Core Courses</td>
</tr>
<tr>
<td>2</td>
<td>Professional Elective Courses Relevant to Chosen Specialization/Branch</td>
</tr>
</tbody>
</table>
3. Open Subjects – Electives from other Technical and / or Emerging Subjects

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Socially Relevant Project</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Mini Project</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Project Phase - I</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Project Phase - II</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>13</td>
</tr>
</tbody>
</table>

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7. Project

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Socially Relevant Project</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Mini Project</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Project Phase - I</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Project Phase - II</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>13</td>
</tr>
</tbody>
</table>

8. Audit Courses (Non Credit Course)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Induction Program</td>
</tr>
<tr>
<td>2</td>
<td>Constitution of India</td>
</tr>
<tr>
<td>3</td>
<td>Essence of Indian Traditional Knowledge</td>
</tr>
<tr>
<td>4</td>
<td>Environmental Science</td>
</tr>
</tbody>
</table>

BOS Chairman shall notify the list of MOOCs offered (Open Elective & Professional Elective) in the beginning of the semester.

2. PROGRAM PATTERN:

**B.Tech.:** The program is for 4 academic years / 8 semesters.

**B.Tech. (Lateral Entry):** The program is for 3 academic years / 6 semesters.

3. AWARD OF DEGREE:

**B.TECH:**

A student will be declared eligible for the award of degree if he/she fulfills the following academic regulations.

a) A student shall be declared eligible for the award of degree, if he/she pursues a course of study for not less than four academic years and not more than eight academic years from the date of admission.

b) The student shall register for 160 credits and secure all 160 credits.

c) The medium of instruction for the entire under graduate program in Engineering & Technology will be in English only.

d) Skill oriented courses are embedded with domain specific, communication and Advanced / elective courses.

e) A student shall also register and successfully complete audit programs (Non-credit) as recommended by Academic Council.

f) A student on completing 1st year class work may opt for a break of 1 year which shall
be deemed as GAP year, as recommended by APSCHE, for undertaking successful entrepreneurial ventures.

g) Students who fail to complete Four Years Course of study within 8 years shall forfeit their seat and their admission shall stand cancelled.

B.TECH. (Honors)/(Minors):

B.Tech. with Honors or B.Tech. with Minor will be awarded if the student earns 20 additional credits as per the regulations/guidelines.

B.TECH (Lateral Entry):

A student will be declared eligible for the award of degree on fulfilling the following academic requirements.

a) A student shall be declared eligible for the award of the degree, if he/she pursues a course of study for not less than three academic years and not more than six academic years.

b) The student shall register for 126 credits and secure all 126 credits.

c) A student shall also register and successfully complete audit programs (Non-credit) as recommended by Academic Council.

d) Students who fail to complete their three Years Course of study within 6 years shall forfeit their seat and their admission shall stand cancelled.

e) Student shall register for bridge programs, if any, as administered by the respective departments at the beginning of 2nd year and successfully complete as per the guidelines of the Institution.

B.TECH. (Honors)/(Minors):

B.Tech. with Honors or B.Tech. with Minor will be awarded if the student earns 20 additional credits as per the regulations/guidelines.

4. CERTIFICATION PROGRAMS:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Dept.</th>
<th>Name of the Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MECH</td>
<td>Windchill 10.2 PDM by Adroitec Engineering Solutions Pvt. Ltd., Hyderabad</td>
</tr>
<tr>
<td>2</td>
<td>MECH</td>
<td>Creo 2.0 by PTC</td>
</tr>
<tr>
<td>3</td>
<td>MECH</td>
<td>Edgcam by Verosoft, UK</td>
</tr>
<tr>
<td>4</td>
<td>MECH</td>
<td>ANSYS Training and Certification by Mechanical Department</td>
</tr>
<tr>
<td>5</td>
<td>MECH</td>
<td>AUTOCAD Training and Certification by Mechanical Department</td>
</tr>
<tr>
<td>6</td>
<td>MECH</td>
<td>Catia by APSSDC-Dassault Systems, CM’s Center of Excellence</td>
</tr>
<tr>
<td>7</td>
<td>MECH</td>
<td>Delmia by APSSDC-Dassault Systems, CM’s Center of Excellence</td>
</tr>
<tr>
<td>8</td>
<td>MECH</td>
<td>Simulia by APSSDC-Dassault Systems, CM’s Center of Excellence</td>
</tr>
<tr>
<td>9</td>
<td>MECH</td>
<td>2-Wheeler Automobile Certification by APSSDC-SIEMENS</td>
</tr>
<tr>
<td>10</td>
<td>MECH</td>
<td>4-Wheeler Automobile Certification by APSSDC-SIEMENS</td>
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<tr>
<td></td>
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<tr>
<td>---</td>
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</tr>
<tr>
<td>11</td>
<td>MECH</td>
<td>Welding Certification by APSSDC-SIEMENS</td>
</tr>
<tr>
<td>12</td>
<td>MECH</td>
<td>CNC Certification by APSSDC-SIEMENS</td>
</tr>
<tr>
<td>13</td>
<td>MECH</td>
<td>Commercial Electrical Certification by APSSDC-SIEMENS</td>
</tr>
<tr>
<td>14</td>
<td>MECH</td>
<td>Solid Edge Certification by APSSDC-SIEMENS</td>
</tr>
<tr>
<td>15</td>
<td>CHEM</td>
<td>Chemical Process Design and Simulation by Simtech Simulations, Hyderabad</td>
</tr>
<tr>
<td>16</td>
<td>ECE</td>
<td>Embedded Systems by Think LABS, Mumbai</td>
</tr>
<tr>
<td>17</td>
<td>ECE</td>
<td>Labview by National Instruments Systems India Pvt. Ltd.</td>
</tr>
<tr>
<td>18</td>
<td>ECE</td>
<td>Unified Technology Learning Program (UTLP) by Wipro Mission 10X</td>
</tr>
<tr>
<td>19</td>
<td>CSE, IT</td>
<td>PEGA by Virtusa Corporation</td>
</tr>
<tr>
<td>20</td>
<td>CSE, IT</td>
<td>Microsoft technologies by Microsoft Corp.</td>
</tr>
<tr>
<td>21</td>
<td>CSE, IT</td>
<td>Ethical Hacking by EC-Council Academia</td>
</tr>
<tr>
<td>22</td>
<td>CSE, IT</td>
<td>Java and C by Talent Sprint</td>
</tr>
<tr>
<td>23</td>
<td>CSE, IT</td>
<td>Network Analyst (CCNA) by Cisco Systems Inc</td>
</tr>
<tr>
<td>24</td>
<td>CSE, IT</td>
<td>Java Programming (OCJP) and DBMS by Oracle</td>
</tr>
<tr>
<td>25</td>
<td>EEE</td>
<td>PLC, Drives and Automation by Siemens</td>
</tr>
<tr>
<td>26</td>
<td>EEE</td>
<td>PLC by New Dawn Automation</td>
</tr>
<tr>
<td>27</td>
<td>EEE</td>
<td>Home Electrical Certification by APSSDC-SIEMENS</td>
</tr>
<tr>
<td>28</td>
<td>Civil</td>
<td>Remote Sensing and GIS by Indian Institute of Remote Sensing</td>
</tr>
</tbody>
</table>

a) The Institution shall offer the certification programs by itself or in collaboration with industry/such other Institutions deemed to have specialized expertise in the proposed area of training.

b) Only students of the Institution shall be eligible to register on payment of prescribed fee.

c) However, subject to availability of resources and the demand the Institution may offer the program to external candidates meeting the pre-qualification requirements and in the order of the merit.

d) The duration of the course and design of the content shall be done by the respective departments of the Institution by themselves or in collaboration with industry/such other institutions deemed to have specialized expertise in the proposed area of training.

e) If the duration of the course is less than or equal to 40 hours, it can be completed in one semester, otherwise, it can suitably distributed over a number of semesters.

f) Mere enrolment/registration for the program shall not entitle any claim for award of certificate.

g) A candidate shall be deemed eligible for the award of the certificate if he/she
   • Attends at least 75% of scheduled training sessions
   • Complies to all the requirements of submission of the assignments, presentations, seminars, projects, etc., and also appears for periodic tests.
   • Shall attain minimum levels of performance in tests as prescribed.
   • Shall remit such fee as deemed fit for the certification
   • A candidate registered and failed to meet the requirements shall be permitted to repeat the said training one another time after remitting 25% of the fee fixed for the program as re-registration fee.

If the student is absent for the periodic tests, the test shall be re-conducted on payment of
5. COURSES OFFERED:

<table>
<thead>
<tr>
<th>Name of the Program</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>UG Programs (Engineering &amp; Technology)</td>
<td></td>
</tr>
<tr>
<td>B.Tech. (Civil)</td>
<td>B.Tech. (EEE)</td>
</tr>
<tr>
<td>B.Tech. (Mech.)</td>
<td>B.Tech. (ECE)</td>
</tr>
<tr>
<td>B.Tech. (CSE)</td>
<td>B.Tech. (CHEM)</td>
</tr>
<tr>
<td>B.Tech. (IT)</td>
<td>B.Tech. (IT)</td>
</tr>
<tr>
<td>PG Programs (Engineering &amp; Technology)</td>
<td></td>
</tr>
<tr>
<td>M.Tech. (Structural Engineering)</td>
<td>M.Tech. (Power Systems)</td>
</tr>
<tr>
<td>M.Tech. (PDM)</td>
<td>M.Tech. (VLSI)</td>
</tr>
<tr>
<td>M.Tech. (CN&amp;IS)</td>
<td>M.Tech. (CN&amp;IS)</td>
</tr>
<tr>
<td>Other PG Programs</td>
<td>MBA</td>
</tr>
<tr>
<td>Research Programs</td>
<td>Ph.D. in Civil, EEE, MECH, ECE, CSE, CHEM, MBA and MATHS</td>
</tr>
</tbody>
</table>

6. DISTRIBUTION AND WEIGHTAGE OF MARKS:

B.Tech.:

a). Theory:

All Theory courses will have 5 units and assessed for 100 marks, of which, 30 marks for internal assessment and 70 marks for semester end external examination.

Internal Assessment:

- Subjective tests - 15 Marks
- Objective tests - 10 Marks
- Assignments - 05 Marks

- Two Mid – Term examinations (Cycle 1 and Cycle2) shall be conducted. One on first 50% of the syllabus and second on remaining 50% of the syllabus.
- Each Mid Term examination consists of a) Subjective test b) Objective test c) Assignment
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 5 marks (No choice) and assessed for 15 marks
- Each objective test shall be conducted for 20 minutes and have 20 Multiple
Choice Questions each for 1/2 mark and assessed for 10 Marks.

- Assignments shall be assessed for 5 marks.
- The total marks assessed for each Mid – Term examination (Cycle 1 or Cycle 2) is 30 marks.
- Final internal marks can be calculated with 80% weightage for the better of the two Mid-Term examinations and 20% weightage for other Mid-Term examination.

**Example:**

Mid-Term 1 (Cycle 1) Marks = Marks secured in (Subjective test-1 + Objective test-1 + Assignment-1)

Mid-Term 2 (Cycle 2) Marks = Marks secured in (Subjective test-2 + Objective test-2 + Assignment-2)

Final internal marks = [ Best of (Mid term-1/Mid - Term-2) marks X 0.8 + Least of (Mid Term-1/Mid Term-2) marks X 0.2 ]

**External Assessment:**

- External examination is for 70 marks (180 min). Question paper contains 10 questions (2 questions from each unit) and each question carries 14 marks. Student shall answer 5 questions (1 question from each unit).

**i) Design Thinking and Product Innovation - Evaluation pattern**

**Internal Assessment:** 30 Marks

- Project based learning - 20 Marks
- Assignments - 10 Marks

**Project based learning:** The student has to identify a problem and provide a solution by applying design thinking methodologies and submit a report, which is assessed for 20 Marks.

**Assignments:** The student has to submit 4 assignments (1 for each unit) and assessed for 10 marks. Each assignment shall consist of 4 questions (4X10 = 40 marks) and the same shall be scaled down to 10 marks. Average of 4 assignments shall be considered as final assignment marks.

**External Assessment:** 70 Marks

External examination is for 70 marks (180 min). Question paper contains 8 questions from first IV units (2 questions from each unit) and each question carries 12 marks. Student shall answer 4 questions from first IV units (1 question from each unit) and case study (22 Marks) from V unit.

**ii) Internet of Things (IoT), Surveying and Geomatics, MAT Lab Programming, Programming with Lab View, Embedded Processor - Evaluation pattern**

**Internal Assessment:** 30 Marks

- Subjective Test - 15 Marks
- Project based learning - 15 Marks
• Two subjective tests shall be conducted.
• Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 5 marks (No choice) and assessed for 15 marks
• Project based learning shall be assessed for 15 Marks.
• In Project based learning, a student has to identify a problem such that at least 3 or 4 modular learning of experiments shall be integrated and submit comprehensive report with solution at the end of the semester.
• Final internal marks (30 Marks) can be calculated with 80% weightage for the better of the two subjective tests (15 Marks) and 20% weightage for other subjective test plus + Project based learning (15 Marks).

**External Assessment:** 70 Marks

External examination is for 70 marks (180 min). Question paper contains 10 questions (2 questions from each unit) and each question carries 14 marks. Student shall answer 5 questions (1 question from each unit).

b). **Laboratory/Practice:**

All Laboratory/Practice courses are assessed for 50 marks, of which, 15 marks for internal assessment and 35 marks for semester end external examination.

**Internal Assessment :** (15 Marks)

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous assessment</td>
<td>05</td>
</tr>
<tr>
<td>Project based learning</td>
<td>05</td>
</tr>
<tr>
<td>Internal test</td>
<td>05</td>
</tr>
</tbody>
</table>

• Continuous assessment for 05 marks for each experimental session finally averaged to 05 marks.
• Project based learning shall be assessed for 05 Marks.
• In Project based learning, a student has to identify a problem such that at least 3 or 4 modular learning of experiments shall be integrated and submit comprehensive report with solution at the end of the semester.
• An internal assessment test conducted at the end of the semester shall be assessed for 05 marks.

**Semester End Assessment:**

• Semester end examination is for 35 marks (180 min) conducted and assessed by both external and internal examiners.
• Both internal and external examination shall include assessment of the student on
  a) Knowledge of principles/concepts involved
  b) Experimental design
  c) Result interpretation and analysis
d) Experimental report

c). Drawing/Design/Estimation:

i) Computer Aided Engineering Graphics:

Evaluation Procedure:

The course will have 5 units and assessed for 100 marks, of which, 30 marks for internal assessment and 70 marks for semester end external examination.

**Internal Assessment : (30 Marks)**

- Continuous assessment : 10 Marks
- Project based learning : 10 Marks
- Internal Test : 10 Marks

**Semester End Assessment:**

- Semester end examination is for 70 marks (180 min) conducted and assessed by both external and internal examiners.
- Question paper contains 3 questions (with internal choice). Each question carries 20 marks (5 marks for free hand drawing and list of commands & 15 marks for final drawing prepared in AUTOCAD). A Student shall answer all questions.
- Viva Voce for 10 Marks.

ii) Computer Aided Geometric Design and Assembly:

Evaluation Procedure:

The course will have 5 units and assessed for 50 marks, of which, 15 marks for internal assessment and 35 marks for semester end external examination.

**Internal Assessment : (15 Marks)**

- Continuous assessment : 10 Marks
- Project based learning : 05 Marks

**Semester End Assessment:**

- Semester end examination is for 35 marks (180 min) conducted and assessed by both external and internal examiners.
- Semester End Examination shall include assessment of the student on Final drawings like modeling, assembly and drafting.
- Student is expected to execute one exercise.
- Final drawings like modeling, assembly and drafting hard copies shall be evaluated by both internal and external examiners

iii) Design and Drawing Courses

Evaluation Procedure:
The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

**Internal Assessment:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective Test</td>
<td>20</td>
</tr>
<tr>
<td>Assignments</td>
<td>10</td>
</tr>
<tr>
<td>Design and Drawing reports</td>
<td>10</td>
</tr>
</tbody>
</table>

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Assignments shall be assessed for 10 marks.
- Design and drawing reports shall be assessed for 10 marks.

**External Assessment:**

The end examination question paper consists of Part A and Part B.

Part A consists of two questions regarding Design and Drawing (from two clusters clearly mentioned in the syllabus). Each question carries 20 marks. The student shall answer any 1 question.

Part B consists of four questions (from the remaining four clusters) with internal choice and all four are to be answered. Each question carries 10 marks.

**iv) Estimation and Costing Courses**

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

**Internal Assessment:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective Test</td>
<td>20</td>
</tr>
<tr>
<td>Assignments</td>
<td>10</td>
</tr>
<tr>
<td>Bar bending schedules</td>
<td>10</td>
</tr>
</tbody>
</table>

Estimation and cost analysis reports

Two subjective tests shall be conducted.

- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Assignments shall be assessed for 10 marks.
- Bar bending schedules, Estimation and cost analysis reports shall be assessed for 10 marks.
External Assessment:
External examination is for 60 Marks. The question paper consists of 2 questions. Each question carries 60 Marks. The student shall answer 1 question.

In each question, the section, plan and reinforcement drawings of various members of a building will be given and the following items are to be calculated.

- Quantities of all the items (20 Marks).
- Reinforcement tonnage and Bar bending schedule (10 Marks).
- Specifications (10 Marks).
- Rates of all the items as per Standard Schedule of Rates (20 Marks).

Non Credit Mandatory Courses: The student has to secure 40% of the marks allotted in the internal evaluation for passing the course (Satisfactory or Not-Satisfactory). No marks or letter grade shall be allotted.

Procedure for conduct and Evaluation of MOOCs.: The student shall register for the (Minimum of 12 weeks) offered by SWAYAM/NPTEL as Program elective/Open elective with the approval of the Head of the Department. The Head of the Department shall appoint one mentor for each MOOC. The student has to register the course in SWAYAM/NPTEL portal. The student has to submit the pass certificate issued by SWAYAM/NPTEL after completion of the course.

Socially Relevant Project:
- A student shall identify and provide a solution to the problem relevant to society/Profession/Industry.
- A student shall engage at least 15 hours on socially relevant project. Socially relevant project shall be evaluated internally for 50 marks by Project Review Committee (PRC). PRC comprising of HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide shall review the progress.

Mini Project:
- A student shall undergo internship for a period of 4 weeks/provide solution to the problem relevant to Industry/ Modern tool during the vacation after VI semester and submit comprehensive report.
  - Mini project shall be evaluated internally for 50 marks by Project Review Committee (PRC).
  - PRC shall prepare rubrics for assessment.
Project Evaluation:

Project is divided into 2 phases – Phase I & Phase II and assessed for 200 Marks.

- Evaluation shall comprise of internal and external assessment.
  - Internal: 60 Marks
  - External: 140 Marks

- A project Review committee (PRC) comprising of HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide shall review the progress once in four weeks.

Project Phase I:

- Project Phase I shall be evaluated along with Project Phase II.
- A student shall undertake project phase I during the VII semester.
- A student shall report to the guide/external supervisor and work under his supervision at least 2 hours per week.
- Assessment shall be on
  - Literature review
  - Identification and statement of the Problem

Project Phase II:

- A student shall undertake project phase II during the VIII semester.
- A student shall report to the guide/external supervisor and work under his supervision at least 8 hours per week.
- Internal evaluation shall be done by HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide for 60 marks.
- External evaluation shall be done by HoD, Guide/Internal Examiner and External Examiner for 140 marks.
- Assessment shall be on
  a) Review on fundamental knowledge involved
  b) Inter disciplinary aspect
  c) Experimental/methodology design
  d) Result analysis and interpretations
  e) Report writing
  f) Team work
  g) Presentation
  h) Viva-voce
B.Tech. (Lateral Entry):

The rules and regulations for candidates admitted under lateral entry category for 2\textsuperscript{nd}, 3\textsuperscript{rd} and 4\textsuperscript{th} years of study shall be same as applicable to regular B.Tech students.

7. ATTENDANCE REGULATIONS:

B.Tech.:

I. A student shall be eligible to appear for end semester examinations, if he or she acquires a minimum of 75% of attendance in aggregate of all the subjects (Theory & Lab.) for the semester.

II. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the college academic committee.

III. Shortage of attendance below 65% in aggregate of all the subjects (Theory & Lab) for the semester shall not be Condoned.

IV. Detained student shall seek re-admission for that semester when offered within 4 weeks from the date of commencement of class work.

PROMOTION RULE (Based on attendance):

- A Student shall be promoted to the next semester on fulfillment of minimum attendance requirement (75%) of current semester.

PROMOTION RULE (Based on credits):

- A student shall be promoted from IV semester to V semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to either III semester or IV semester from the following examinations irrespective of whether the candidate takes the examination or not.
  - Two regular and Two supplementary examinations of I semester
  - Two regular and One supplementary examinations of II semester
  - One regular examination and One supplementary examination of III semester
  - One regular examination of IV semester.

- A student shall be promoted from VI semester to VII semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to either V Semester or VI semester from the following examinations irrespective of whether the candidate takes the examination or not.
- Three regular and Three supplementary examinations of I semester
- Three regular and Two supplementary examinations of II semester
- Two regular and Two supplementary examinations of III semester
- Two regular and One supplementary examinations of IV semester
- One regular and One supplementary examination of V semester
- One regular examination of VI semester.

**B.TECH (Lateral Entry):**

**PROMOTION RULE (Based on attendance):**
A Student shall be promoted to the next semester on fulfillment of minimum attendance requirement of current semester.

**PROMOTION RULE (Based on credits):**
A student shall be promoted from VI semester to VII semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to either V semester or VI semester from the following examinations irrespective of whether the candidate takes the examination or not.
- Two regular and Two supplementary examinations of III semester
- Two regular and one supplementary examinations of IV semester
- One regular and One supplementary examinations of V semester
- One regular examination of VI semester.

**B.Tech. (Lateral Entry):**

The rules and regulations for candidates admitted under lateral entry category for 2nd, 3rd and 4th years of study shall be same as applicable to regular B.Tech students.

**8. MINIMUM ACADEMIC REQUIREMENTS:**

**B.Tech.: (Theory/Lab)**

i. A student is deemed to have satisfied the minimum academic requirements for a course on securing minimum 35% of marks in the semester end exam and minimum 40% of marks in the sum total of the internal marks and semester end marks.

**B.Tech. (Lateral Entry):**

The rules and regulations for candidates admitted under lateral entry category for 2nd, 3rd and 4th years of study shall be same as applicable to regular B.Tech students.
9. **GRADING SYSTEM:**

**B.Tech. / B.Tech. (Lateral Entry)**

Semester Grade Point Average (SGPA) for the current semester which is calculated on the basis of grade points obtained in all courses, except audit courses and courses in which satisfactory or course continuation has been awarded,

\[
SGPA = \frac{\Sigma (\text{course credits earned x Grade points})}{\Sigma \text{ (Total course credits in the semester)}}
\]

\[
CGPA = \frac{\Sigma (\text{course credits earned x Grade points}) \text{ up to successfully completed semesters}}{\Sigma \text{ (Total course credits up to successfully completed)}}
\]

The UGC recommends a 10-point grading system with the following letter grades as given below:

- O  (Outstanding)  10
- A+ (Excellent)  9
- A  (Very Good)  8
- B+ (Good)  7
- B  (Above Average)  6
- C  (Average)  5
- P  (Pass)  4
- F  (Fail)  0
- Ab (Absent)  0

* iii. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

<table>
<thead>
<tr>
<th>Marks Range Theory (Max – 100)</th>
<th>Marks Range Lab (Max – 50)</th>
<th>Level</th>
<th>Letter Grade</th>
<th>Grade Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥90</td>
<td>≥45</td>
<td>Outstanding</td>
<td>A+</td>
<td>10</td>
</tr>
<tr>
<td>≥80 to &lt;89</td>
<td>≥40 to &lt;44</td>
<td>Excellent</td>
<td>A</td>
<td>9</td>
</tr>
<tr>
<td>≥70 to &lt;79</td>
<td>≥35 to &lt;39</td>
<td>Very Good</td>
<td>B</td>
<td>8</td>
</tr>
<tr>
<td>≥60 to &lt;69</td>
<td>≥30 to &lt;34</td>
<td>Good</td>
<td>C</td>
<td>7</td>
</tr>
</tbody>
</table>
Illustration of Computation of SGPA and CGPA and Format for Transcripts

Computation of SGPA and CGPA

**Illustration for SGPA**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
<th>Grade</th>
<th>Grade point</th>
<th>Credit Point (Credit x Grade)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course 1</td>
<td>3</td>
<td>A</td>
<td>8</td>
<td>3 X 8 = 24</td>
</tr>
<tr>
<td>Course 2</td>
<td>4</td>
<td>B+</td>
<td>7</td>
<td>4 X 7 = 28</td>
</tr>
<tr>
<td>Course 3</td>
<td>3</td>
<td>B</td>
<td>6</td>
<td>3 X 6 = 18</td>
</tr>
<tr>
<td>Course 4</td>
<td>3</td>
<td>O</td>
<td>10</td>
<td>3 X 10 = 30</td>
</tr>
<tr>
<td>Course 5</td>
<td>3</td>
<td>C</td>
<td>5</td>
<td>3 X 5 = 15</td>
</tr>
<tr>
<td>Course 6</td>
<td>4</td>
<td>B</td>
<td>6</td>
<td>4 X 6 = 24</td>
</tr>
</tbody>
</table>

\[\text{Thus, SGPA} = \frac{139}{20} = 6.95\]

**Illustration for CGPA**

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 3</th>
<th>Semester 4</th>
<th>Semester 5</th>
<th>Semester 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits: 16</td>
<td>Credits: 18</td>
<td>Credits: 25</td>
<td>Credits: 21</td>
<td>Credits: 23</td>
<td>Credits: 22</td>
</tr>
<tr>
<td>SGPA: 7.9</td>
<td>SGPA: 7.8</td>
<td>SGPA: 7.6</td>
<td>SGPA: 8.0</td>
<td>SGPA: 8.3</td>
<td>SGPA: 8.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 7</th>
<th>Semester 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits: 21</td>
<td>Credits: 14</td>
</tr>
<tr>
<td>SGPA: 8.2</td>
<td>SGPA: 8.5</td>
</tr>
</tbody>
</table>

\[\text{Thus, CGPA} = \frac{16 \times 7.9 + 18 \times 7.8 + 25 \times 7.6 + 21 \times 8.0 + 23 \times 8.3 + 22 \times 8.6 + 21 \times 8.2 + 14 \times 8.5}{160} = 8.1\]

10. ELIGIBILITY FOR AWARD OF DEGREE:
B.Tech:

A student shall be eligible for award of the degree if he/she fulfills the following conditions:

1) Successfully completes all the courses prescribed for the Program.
2) CGPA greater than or equal to 5.0 (Minimum requirement for Pass),

11. AWARD OF CLASS:

B.Tech:

Eligible Candidates for the award of B.Tech., Degree shall be placed in one of the following Classes based on CGPA.

<table>
<thead>
<tr>
<th>CLASS</th>
<th>CGPA</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class with Distinction</td>
<td>( \geq 7.75 )</td>
<td>From the CGPA secured from 126 credits from III semester to VIII semester</td>
</tr>
<tr>
<td></td>
<td>(Without any Supplementary appearance)</td>
<td></td>
</tr>
<tr>
<td>First Class</td>
<td>( \geq 6.75 )</td>
<td></td>
</tr>
<tr>
<td>Second Class</td>
<td>( \geq 5.75 ) to &lt; 6.75</td>
<td></td>
</tr>
<tr>
<td>Pass Class</td>
<td>( \geq 5.00 ) to &lt; 5.75</td>
<td></td>
</tr>
</tbody>
</table>

12. CURRICULAR FRAMEWORK FOR HONORS PROGRAMME:

The goal of introducing B.Tech (Hons) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research. All the students pursuing regular B.Tech with prerequisite CGPA are eligible to register for Honors degree course. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the B.Tech Honors degree ie 180 credits. The additional courses shall be advanced subjects in the concerned department/discipline. The department concerned will determine required courses for award of Honor degree. The subjects in the Honor degree would be a combination of core (theory and lab) and some electives

OBJECTIVES:

The objectives of initiating the B. Tech (Honors) degree are:
To encourage the undergraduate students towards higher studies and Research

To prepare the students to acquire specialized knowledge in core Engineering streams

To attain the high-level competence in the specialized area of Under Graduate program.

To learn the best educational and professional skills in the specialized area.

To provide the opportunity to learn the post graduate level courses in the specified undergraduate program.

**Applicability and Enrolment:**

- To all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology

- The Honors degree will be offered at all JNTUK affiliated colleges (Autonomous and Non-Autonomous).

- The department offering Honors shall have at least one M. Tech in concerned stream, for B.Tech (Honors) registration.

- Total number of seats offered for a Honor program shall be a maximum of 35% of sanctioned intake .

- The allotment of seat into Honors degree is based on the percentage of marks obtained up to III semester in case of regular entry students and only III semester in case of lateral entry students

- In the event of any tie during the seat allotment for a Honors degree, the concerned major degree department offering Honor shall conduct a test/interview on the prerequisite subjects of Honors degree and final decision shall be taken.

- For applicability of Honors degree, both regular B Tech and Honors degree courses shall be successfully completed with specified SGPA/GCPA

- Transfer of credits from a particular minor to regular B. Tech or another major degree and vice versa shall not be permitted

- Institutions having at least two NBA accredited B.Tech/M.Tech programs can offer B.Tech(Honors) The Program departments should have valid NBA accreditation at the time of registration of the student for B.Tech (Honors).

**Entry level:**

- The B. Tech students (both Regular and Lateral Entry) pursuing a major degree
program can register for Honors degree.

- Students registering for Honors degree shall select the subjects from same branches/department based on the recommendations of BOS committee. For example, if a student pursuing major degree in Electrical & Electronics Engineering shall select subjects in Electrical & Electronics Engineering only and he/she will get major and Honors degree in Electrical & Electronics Engineering.

- Only those students, who have a CGPA of 8.0 or above, without any backlog, will be permitted to register for a Honors degree.

- An SGPA or CGPA in excess of 8.0 has to be maintained in the subsequent semesters in major as well as Honors degree without any backlogs in order to keep Honors degree registration active.

- Should both the SGPA and CGPA fall below 8.0 at any point after registering for the Honors, the Honors degree registration will cease to be active.

- A student registered for Honors degree in a discipline must register and pass in all subjects with a minimum GPA of 8.0 that constitute requirement for award of Honors degree.

- Separate SGPA/CGPA shall be shown on semester and final transcripts of regular B.Tech and Honор.

- Students shall not be permitted to register for Honors degree after completion of VI semester.

- Students shall be permitted to select a maximum of two subjects per semester from the list of subjects specified for Honors degree.

- The students shall complete Honors degree without supplementary appearance within stipulated period as notified by JNTUK for the completion of regular major B. Tech. program.

- Honors degree shall not be awarded at any circumstances without completing the regular major B Tech program in which a student got admitted.

- If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses for Honors degree.

- If a student failed in any registered course of the Honors, he/she shall not be eligible to continue the B. Tech Honors. However, the additional credits and grades thus far earned - by the student shall be included in the grade card but
shall not be considered to calculate the CGPA.

- The subjects completed under Honors degree program shall not be considered as equivalent subjects in case the student fails to complete the major degree program.
- Students completed their degree shall not be permitted to register for Honors degree

**Structure of Honors in B. Tech. :**

- The student shall earn at least 20 credits for award of Honors degree from same branch/department/discipline registered for major degree
- Students can complete Honors degree courses either in the college or online from platforms like NPTEL/SWAYAM etc.
- Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses list in the departments, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two NPTEL, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.
- The overall attendance in each semester of regular B. Tech courses and Honors degree courses shall be computed separately
- A student shall maintain an overall attendance of 75% in all registered courses of Honors to be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per University norms. On the recommendations of College Academic Council, the student concerned will be permitted to take the semester end examinations. Student having less than 65% attendance in Honors courses shall not be permitted for semester end examinations.
- A student detained due to lack of attendance in regular B Tech program shall not be permitted to continue Honors program
- The teaching, examinations (internal and external) and evaluation procedure of Honors degree courses offered in offline is similar to regular B. Tech courses
- Students may choose theory or practical courses to fulfil the minimum credit requirement.
- Students shall be allowed to take maximum two subjects per semester pertaining to their Honors degree
- The students registered for Honors shall not be permitted to register for B. Tech
Credits requirement:

- A Student will be eligible to get B. Tech (Honors), if he/she completes an additional 20 credits. These may be acquired either in offline or online like NPTEL/SWAYAM.

- The colleges offering Honors degree courses shall be ready teach the courses in offline at their college in the concerned departments. Curriculum and the syllabus of the courses shall be approved by the Board of Studies.

- The online NPTEL/SWAYAM subjects selected by a student shall be approved by concerned BOS. The duration of courses shall be a minimum of 12 weeks.

- The assessment and certification of the NPTEL shall be as per the prescribed norms of the NPTEL.

- Students shall produce a certificate issued by the NPTEL/SWAYAM conducting agency as a proof of credit attainment.

- The teaching and evaluation procedure of Honors courses offering in offline mode shall be similar to that of regular B. Tech courses.

- After successful completion of all major and Honors degree courses with specified CGPA the University will award B. Tech (Honors).

- If a student fails to complete a course offered in online/offline, he/she will not be permitted to continue the Honors degree.

Procedure to Applying for Honors degree:

- The department offering the Honors will announce courses required before the start of the session.

- The interested students shall apply for the Honors course to the HOD of the concerned department.

- The concerned department will announce the list of the selected students for the Honors.

- The whole process should be completed within one week before the start of every session.

- Selected students shall be permitted to register the courses for Honors degree.

- Each department offering the Honors degree shall submit the final list of selected students to the principal.

- The selected students shall submit a joining letter to the Principal through the
concerned HOD.

- The department offering Honors shall maintain the record of student pursuing the Honors degree
- With the approval of Principal and suggestion of advisor/mentor, students can choose courses from the approved list and shall register the courses within a week as per the conditions laid down in the structure for the Honor degree.

**Allocation of seats for Honors:**

- The University/institute/colleges will notify the number of the seats for Honor in the concerned department well in advance before the start of the semester
- Total number of seats offered for a Honor programme shall be a maximum of 35% of sanctioned intake.
- The list of the elective for Honor will be offered from the list of running majors in the concerned subjects. Each department of concerned institute will notify the seats for the minor well before the start of each session as per the following Table

<table>
<thead>
<tr>
<th>S. No</th>
<th>S. No Name of the course</th>
<th>Sanction seats of major programme</th>
<th>Seats offered for minor</th>
<th>Courses offered</th>
<th>Credits for each course</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Course Fees for registration of subjects in Major degree:**

There is no fee for registration of subjects for major degree program offered in offline at the respective colleges.

**Examinations:**

(a) The examination for the Honors degree courses offered in offline shall be conducted along with regular B. Tech program.

(b) The examinations (internal and external) and evaluation procedure of Honors degree courses offered in offline is similar to regular B. Tech courses.

(c) A separate transcript shall be issued for the Honor subjects passed in each semester

(d) There is no supplementary examination for the failed subjects in a Honors degree program..

**Examination Fees:**

Examination Fees will be as per the JNTUK norms.

**13. CURRICULAR FRAMEWORK FOR MINOR PROGRAMME:**
The goal of introducing B.Tech. Minor is to facilitate the students to choose additional courses from other branches and some advanced subjects of their respective branch in which they are perusing the degree. This gives a provision to the students to pursue minor other than the discipline in which student got admitted. An aspiring student can choose the courses and laboratories in any other discipline and can get a minor in the chosen specialization in addition to regular major B Tech degree. This way undergraduates are not restricted to learn about courses only in the discipline they get admitted to, but can choose courses of their interest to later on take up a career path of their interest. The students taking up a minor course will get additional credits. A student has to acquire 20 more credits, in addition to 160 credits required for the award of the minor. The department concerned will determine the required courses for award of minor. The subjects in minor program would be a combination of mostly core and some electives of other departments.

**OBJECTIVES:**

The objectives of initiating the minor are.

- To diversify the knowledge of the undergraduates
- To make the undergraduates more employable.
- To have more educational and professional skills after the completion of his undergraduate courses
- To give a scope to specialize students in other streams of engineering in addition to the ones they are currently pursuing.

**Applicability and Enrolment:**

- To all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology
- The minor will be offered at all J.N.T. University affiliated colleges (Autonomous and Non-Autonomous).
- There shall be no limit on the number of programs offered under Minor. The minor programs in emerging technologies based on expertise in the respective departments may be offered and minor can also be offered in collaboration with the relevant industries/agencies.
- Total number of seats offered for a minor program shall be a maximum of 35% sanctioned intake of major degree program.
If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

The allotment of seat into minor is based on the percentage of marks up to III semester in case of regular entry students and only III semester in case of lateral entry students.

For applicability of minor, both regular B Tech and minor courses shall be successfully completed with specified SGPA/CGPA.

Transfer of credits from a particular minor to regular B. Tech or another major degree and vice-versa shall not be permitted.

**Entry level:**

- The B Tech students (both Regular and Lateral Entry) pursuing a major degree program can register for minor from III semester onwards.
- Students registering for minor shall select the subjects from other branches. For example, if a student pursuing major degree in Electrical & Electronics Engineering shall select the subjects specified for minor in Civil Engineering and he/she will get major degree of Electrical & Electronics Engineering with minor of Civil Engineering.
- Student pursuing major degree in any engineering branch is eligible to register for minor in any other engineering branch. However, students pursuing major degree in a particular Engineering are not allowed to register for minor in the same engineering branch.
- Only those students, who have a CGPA of 8.0 or above, without any backlog, will be permitted to register for a minor.
- An SGPA or CGPA in excess of 8.0 has to be maintained in the subsequent semesters in major as well as minor without any backlogs in order to keep the minor registration active.
- Should both the SGPA and CGPA fall below 8.0 at any point after registering for the minor; the minor registration will cease to be active.
- A student registered for minor in a discipline must register and pass in all subjects with a minimum GPA of 8.0 that constitute requirement for award of minor.
- Separate CGPA shall be shown on semester and final transcripts of regular B. Tech and minor.
- Students shall not be permitted to register for minor after completion of VI semester.
- Students shall be permitted to select a maximum of two subjects per semester from the list of subjects specified for minor.
- The students shall complete minor without supplementary appearance within stipulated period as notified by JNTUK for the completion of regular major B. Tech program.
- Minor shall not be awarded at any circumstances without completing the regular major B Tech program in which a student got admitted.
- If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses of minor.
- If a student failed in any registered course of the minor, he/she shall not be eligible to continue the B.Tech minor. However, the additional, credits and grades thus far earned by the student shall be included in the grade card but shall not be considered to calculate the CGPA.
- The subjects completed under minor program shall not be considered as equivalent subjects in case the student fails to complete the major degree program.
- Students completed their degree shall not be permitted to register for minor.

**Structure of Minor in B. Tech:**

- The student shall earn at least 20 credits for award of minor from other branch/department/discipline registered for major degree.
- Students can complete minor courses either in the college or in online from platforms like NPTEL/SWAYAM etc.
- The overall attendance in each semester of regular B. Tech courses and minor courses shall be computed separately.
- A student shall maintain an overall attendance of 75% in all registered courses of minor to be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per University norms. On the recommendations of College Academic Council, the student concerned will be permitted to take the semester end examinations. Student having less than 65% attendance in minor courses shall not be permitted for end semester examinations.
- A student detained due to lack of attendance in regular B. Tech program shall not be permitted to continue minor program
- The teaching, examinations (internal and external) and evaluation procedure of minor courses offered in offline is similar to regular B. Tech courses
- The students may choose theory or practical courses to fulfill the minimum credit requirement.
- The students may be allowed to take maximum two subjects per semester pertaining to their minor
- The students are permitted to opt for only a single minor course in his/her entire tenure of B.Tech (Engineering)
- The students registered for B. Tech (Hons) shall not be permitted to register for minor
- The student is not permitted to take the electives courses from the parent department to fulfill the minimum credit requirement.

**Credits requirement:**
- A Student will be eligible to get minor along with major degree engineering, if he/she completes an additional 20 credits. These may be acquired either in offline or online like NPTEL/SWAYAM
- Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses of minor, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two NPTEL, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.
- Curriculum and the syllabus of the courses shall be approved by the Board of Studies
- The online NPTEL/SWAYAM subjects selected by student shall be approved by concerned BOS. The duration of courses shall be a minimum of 12 weeks.
- The teaching and evaluation procedure of minor courses offering in offline mode shall be similar to that of regular B. Tech courses
- Students shall produce a certificate issued by the NPTEL/SWAYAM conducting agency as a proof of credit attainment
- The assessment and certification of the NPTEL shall be as per the prescribed norms of the NPTEL.
After successful completion of all major and minor courses with specified CGPA the University will award both major and minors

If a student fails to complete a course offered in online/offline, he/she will not be permitted to continue the minor

Procedure to Applying for the Minor:

- The department offering the minor will announce specialization and courses before the start of the session.
- The interested students shall apply through the HOD of his/her parent department.
- The concerned department will announce the list of the selected students for the minor.
- The whole process should be completed within one week before the start of every session.
- Selected students shall be permitted to register the courses for minor

Registering for minor courses:

- Each department offering the minor will submit the final list of selected students to the principal.
- The selected students shall submit a joining letter to the Principal through the concerned HOD offering the minor. The student shall inform same to the HOD of his/her parent department.
- Both parent department and department offering minor shall maintain the record of student pursuing the minor.
- With the approval of Principal and suggestion of advisor, students can choose courses from the approved list and shall register the courses within a week as per the conditions laid down in the structure for the minor.
- If the student wishes to withdraw/change the registration of subject/course, he/she shall inform the same to advisor, subject teacher, HODs of minor department and parent department and Principal within two weeks after registration of the course.

Procedure for Monitoring the Progress of the Scheme:

The students enrolled in the minor courses will be monitored continuously at par with the prevailing practices and examination standards. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
Allocation of seats for minor

➢ The University/institute/colleges will notify the number of the seats for minor in the concerned department well in advance before the start of the semester.

➢ Total number of seats offered for a minor programme shall be a maximum of 35% of sanctioned intake of major degree programme.

➢ The list of the elective for minor will be offered from the list of running majors in the concerned subjects. Each department of concerned institute will notify the seats for the minor well before the start of each session as per the following Table

<table>
<thead>
<tr>
<th>S. No</th>
<th>S. No Name of the course</th>
<th>Sanction seats of major degree programme</th>
<th>Seats offered for minor</th>
<th>Courses offered</th>
<th>Credits for each course</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Course Fees for registration of subjects in Minor degree

There is no fee for registration of subjects for minor degree programme offered in offline at the respective colleges.

Examinations

➢ The examination for the minor courses offered in offline shall be conducted regular along with B. Tech programme.

➢ The examinations (internal and external) and evaluation procedure of minor courses offered in offline is similar to regular B. Tech courses.

➢ A separate transcript shall be issued for the minor subjects passed in each semester

➢ There is no supplementary examination for the failed subjects in a minor program

14. INSTRUCTION DAYS:

A semester shall have a minimum of 90 clear instruction days (including internal examinations).

15. Transfers from other Institutions shall not be permitted.

16. SUPPLEMENTARY EXAMINATIONS:

Supplementary examinations shall be conducted within 4 weeks from the date of
announcement of results of regular examinations.

17. **WITHHOLDING OF RESULTS:** The result of a student shall be withheld

- If the student has not paid the dues, if any, to the institution
- If any case of pending disciplinary action,
- Involvement in any sort of malpractices etc.
- Involvement in ragging.

18. **TRANSITORY REGULATIONS:**

a) Detained candidates are eligible for re-admission as and when next offered.

b) The re-admitted candidate will be governed by the rules and regulations under which the candidate has been admitted.

c) In case of transferred students from other Universities, credits shall be transferred to JNTUK as per the academic regulations and course structure of JNTUK.

d) The students seeking transfer to colleges affiliated to JNTUK from various other Universities/Institutions have to obtain the credits of any equivalent subjects as prescribed by JNTUK. The transferred candidates have to write the backlogs/failed subjects, if any, in the same Institution where he/she was admitted.

19. **AMENDMENTS TO REGULATIONS:**

The Academic Council of MVGR College of Engineering (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations, and/or Syllabi or any other such matter relating to the requirements of the program which are compatible to the contemporary/emerging trends effectively meeting the needs of society/industry/stake holding groups.

20. **Regulations for MALPRACTICES during the conduct of examinations**

<table>
<thead>
<tr>
<th>Nature of Malpractices/Improper conduct</th>
<th>Punishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (a) If the candidate 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 he 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 subject of the examination)</td>
<td>Expulsion from the examination hall and cancellation of the performance in that subject only. *</td>
</tr>
<tr>
<td>(b) If the candidate gives assistance or guidance or receives it from any other candidate orally or by any</td>
<td>Expulsion from the examination hall and cancellation of the</td>
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<tr>
<td><strong>other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.</strong></td>
<td><strong>performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.</strong></td>
</tr>
<tr>
<td><strong>2</strong></td>
<td><strong>If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.</strong></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td><strong>If the candidate impersonates any other candidate in connection with the examination.</strong></td>
</tr>
<tr>
<td><strong>4</strong></td>
<td><strong>If the candidate mishandles 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. Also if the answer script is mutilated / damaged disturbing the shape, of the script, answers, the barcode intentionally.</strong></td>
</tr>
<tr>
<td>regulations in connection with forfeiture of seat.*</td>
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<tr>
<td>5.</td>
<td>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.</td>
</tr>
<tr>
<td>6.</td>
<td>Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / 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.</td>
</tr>
<tr>
<td>7.</td>
<td>Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</td>
</tr>
<tr>
<td>8.</td>
<td>Possess any lethal weapon or firearm in the examination hall.</td>
</tr>
<tr>
<td>9.</td>
<td>If student of the college, who is not a candidate 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.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>10</td>
<td>Comes in a drunken condition to the examination hall.</td>
</tr>
<tr>
<td>11</td>
<td>Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.</td>
</tr>
</tbody>
</table>

21. General:

- Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- The academic regulation should be read as a whole for the purpose of any interpretation.
- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

* * *
**Ragging**

Prohibition of ragging in educational institutions Act 26 of 1997

### Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

<table>
<thead>
<tr>
<th>Act</th>
<th>Imprisonment up to</th>
<th>Fine Upto</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teasing, Embarrassing and Humiliation</td>
<td>6 Months</td>
<td>Rs. 1,000/-</td>
</tr>
<tr>
<td>Assaulting or Using Criminal force or Criminal intimidation</td>
<td>1 Year</td>
<td>Rs. 2,000/-</td>
</tr>
<tr>
<td>Wrongfully restraining or confining or causing hurt</td>
<td>2 Years</td>
<td>Rs. 5,000/-</td>
</tr>
<tr>
<td>Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence</td>
<td>5 Years</td>
<td>Rs. 10,000/-</td>
</tr>
<tr>
<td>Causing death or abetting suicide</td>
<td>10 Months</td>
<td>Rs. 50,000/-</td>
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</tbody>
</table>

In Case of Emergency CALL TOLL FREE NO.: 1800 - 425 - 1288

LET US MAKE MVGR A RAGGING FREE CAMPUS
Ragging

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.
# PROGRAM STRUCTURE

**B. TECH – COMPUTER SCIENCE AND ENGINEERING**  
&  
**DEPARTMENT OF INFORMATION TECHNOLOGY**  
(A3 Regulation)

## SEMESTER-I

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
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<td>A3EEL201</td>
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## SEMESTER-III

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Total number of Credits: **24**
## SEMESTER-IV

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<td>Mathematics-IV</td>
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<td>3</td>
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**Total number of Credits:** 22

## Semester – V

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<thead>
<tr>
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<th>Hours per week</th>
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**Total number of Credits:** 23

## Semester - VI

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**Total number of Credits:** 22
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**Total Credits:** 21

## Semester – VIII

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**Total Credits:** 14

## ELECTIVE STREAMS (MAJORS)

**CI-EG1 (Code-1) – Business Intelligence (A3CIT41X)**

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<td>A3CIT412</td>
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**CI-EG2 (Code-2) – Networks (A3CIT42X)**

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<td>A3CIT422</td>
<td>Firewalls &amp; VPN</td>
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<tr>
<td>A3CIT423</td>
<td>Penetration Testing</td>
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## CI-EG3 (Code-3) – Architecture (A3CIT43X)

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<td>A3CIT433</td>
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## CI-EG4 (Code-4) – Applications (A3CIT44X)

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<td>A3CIT444</td>
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## Core Elective – V (A3CIT4XX)

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## Core Elective – VI (Code-9) (A3CIT46X)

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*Cannot Opt if already completed*
GUIDELINES FOR CHOOSING THE CORE ELECTIVES

- A Student has an option to choose **ONE** among the following Streams as a Major Group and complete 4 courses listed that group as Core Electives I, II, III and IV from the respective group.
  1. Business Intelligence
  2. Networks
  3. Architecture
  4. Applications

- A Student has to choose any **ONE** from the list of courses in the table of Core Elective – V, which he has not studied earlier.

- A Student may choose any **ONE** among the courses Listed in Core Elective – VItable, which he has not studied earlier.

**Note:** Each department is offering 4 open elective courses. One elective course is from Humanities (Human Resources Development and Organizational Behavior) which is common to all Engineering departments. 2\textsuperscript{nd} Open elective course should be opted from the other departments (List of Open elective courses offered by various departments are given below). 3\textsuperscript{rd} and 4\textsuperscript{th} Open elective courses (Emerging subjects) should be discipline centric.
<table>
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**OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CHEMICAL ENGINEERING**

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UNIT-I: LINEAR ALGEBRA-1
Rank of a matrix: Elementary row and column transformations, equivalent matrices, Echelon form of a matrix, calculation of rank by reducing the matrix to Echelon form. System of equations: Linear system of equations, homogeneous and non-homogeneous system of equations, consistency criteria, trivial and non-trivial solutions, solving system of equations by Rank method; Eigenvalues and Eigenvectors: Finding Eigenvalues and Eigenvectors, properties of Eigenvalues and Eigenvectors (statements) including spectral mapping theorem.

UNIT-II: LINEAR ALGEBRA-2

UNIT-III: FIRST ORDER DIFFERENTIAL EQUATIONS & APPLICATIONS
Outlines: Differential Equations(DEs), Order and degree of a DE, Formation of DEs, general solutions of a DE; Solving first order and first degree DEs: linear DEs, Bernoulli's DEs (reducible to linear), exact DEs, integrating factors, non-exact DEs (reducible to exact). Applications to real world problems: Newton's law of cooling, laws of growth and decay, family of curves, orthogonality of families curves, orthogonal trajectories (Cartesian and polar curves).

UNIT-IV: HIGHER ORDER DIFFERENTIAL EQUATIONS
Differential equations of higher order: Linear differential equations of higher order, its operator form. Solution concepts: General (complete) solution, particular solution. Solution of linear differential equations of higher order: Auxiliary equations, rules for finding complementary functions, rules for finding particular integrals (general and special methods).

UNIT-V: LAPLACE TRANSFORMS
Laplace transformation: Laplace transformation of elementary functions, Properties: Linearity, change of scale, first shifting properties, finding Laplace transformations using properties, Advanced properties: Laplace transformations of derivatives and integrals, multiplication by $t^n$, division by $t$ (statements), finding Laplace transformations using advanced properties; Inverse Laplace transformations: Finding inverse Laplace transformations using partial fractions, statement of Convolution theorem, finding inverse Laplace transformations by Convolution theorem; Applications: Solving Initial Value Problems by using Laplace transformations.

//Topics prefixed with ‘outlines / overview’ are not for assessment//
TEXT BOOKS:

REFERENCE BOOKS:

COURSE OUTCOMES: Learners at the end of this course will be able to

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<td>Recall the solution methods and applicability of first order differential equations</td>
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<tr>
<td>CO 3</td>
<td>KO#3</td>
<td>Recall the solution methods of higher order differential equations and the concepts of Laplace transforms</td>
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<tr>
<td>CO 4</td>
<td>UO#1</td>
<td>Use and interpret the concepts of linear algebra</td>
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<tr>
<td>CO 5</td>
<td>UO#2</td>
<td>Use and interpret solution methods and applicability of first order differential equations</td>
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<td>CO 6</td>
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<td>Use and interpret solution methods of higher order differential equations and the concepts of Laplace transforms</td>
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<td>Apply the concepts of linear algebra, differential equations and Laplace transformation to model and solve real world problems</td>
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CO/PO Mapping

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Course designed by DEPARTMENT OF MATHEMATICS

Approval
Approved by: Meeting of Board of Studies held on 06.07.2019
SYLLABUS

UNIT-I: WAVE OPTICS [10hrs]

UNIT-II: MAGNETIC PROPERTIES OF MATERIALS [8hrs]

UNIT-III: DIELECTRIC PROPERTIES OF MATERIALS [8hrs]

Unit-IV: HEAT TRANSFER [10hrs]

UNIT-V: QUANTUM PHYSICS & SEMICONDUCTORS [12hrs]
Introduction- Intrinsic semiconductors– Carrier concentration (qualitative)- Electrical conductivity- Extrinsic semiconductors– Carrier concentration (qualitative)- Drift and Diffusion currents- Direct and Indirect band gap semiconductors- Light emitting diode– Solar cell- Hall effect- Applications.
TEXTBOOKS:

REFERENCES:
1. RESNICK, HALLIDAY and WALKER, Principles of Physics, Wiley Publishers

COURSE OUTCOMES:
CO1. Student will be able to gain knowledge on basics of interference, diffraction and polarization of light.
CO2. Student will be able to gain knowledge on fundamentals of magnetic properties of materials and the polarization mechanisms of dielectrics.
CO3. Student will be able to gain knowledge on modes of heat transfer and the essentials of quantum physics & semiconductors for engineers.

CO4. The students will be able to understand and recognize the principle behind working of optical devices.

CO5. The students will be able to understand and recognize the underlying property behind working of electric and magnetic components in devices.

CO6. The students will be able to understand and recognize the importance of heat transfer and quantum mechanics based semiconductor devices.

CO7. The students will have the ability to apply the conceptual knowledge of principles of quantum physics in designing and developing engineering applications.

CO/PO MAPPING:

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Course designed by
DEPARTMENT OF PHYSICS

Approval
Approved by: Meeting of Board of Studies held on 29.06.2019
SYLLABUS

UNIT – I: [9 HOURS]
INTRODUCTION: Introduction to Programming, Computer System, Hardware and Software concepts.
PROBLEM SOLVING: Algorithm, Pseudo-code, flow-chart, program development steps, high-level, Assembly and machine languages.
BASICS OF C PROGRAMMING: Structure of C program, identifier, basic data types and sizes, constants, variables, arithmetic operators, relational operators, logical operators, increment and decrement operators, assignment operator, conditional operator, scanf and printf built-in functions, Creating and running programs.

UNIT – II: [9 HOURS]
BIT-WISE OPERATORS: logical, shift, rotation, masks.
EXPRESSIONS: expressions, type conversions, conditional expressions, precedence and order of evaluation.
SELECTION: Two-way selection: if-else, nested if, examples, multi-way selection: switch, else-if, examples.
ITERATIVE: loops - while, do-while and for statements, break continue, event and counter controlled loops.

UNIT – III: [18 HOURS]
Part – I: [9 HOURS]
ARRAYS: Arrays (1-D, 2-D), Character arrays and Strings, Searching (Linear Search and Binary Search).
Part – II: [9 HOURS]
BASIC ALGORITHMS: Basic Sorting Algorithms (Bubble, Insertion and Selection), comparing algorithms for complexity.
FUNCTIONS: Functions, Scope and Extent of Variables, Function Parameters, parameter passing using call-by-value, sub-routines, Storage Classes,#define,#ifdef, #ifndef pre-processor directives.

UNIT – IV: [9 HOURS]
RECURSION: Definition of Recursion, example programs using recursion like finding Factorial, Fibonacci series, Quick sort, puzzle solving using recursive functions (towers of hanoi, ackerman function).
POINTERs: Definition of Pointers, Pointer Type, Pointer Arithmetic, Function parameter passing using call-by-reference.
MEMORY ALLOCATION: Difference between static and dynamic memory allocation, dynamic memory allocation using built-in functions, dangling pointer, unreferenced memory problem.

UNIT – V: [9 HOURS]
ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures-declaration, definition and initialization of structures, accessing structures, nested structures,
arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, concept of linked list, program applications.

**FILE-HANDLING:** Input and output - concept of a file, text files and binary files, Formatted I/O, File I/O operations, command line arguments.

**Suggested Text Books**
2. Programming In C: A Practical Approach, Ajay Mittal, Pearson Education

**Suggested Reference Books**
1. Brian W. Kernighan And Dennis M. Ritchie, The C Programming Language, Prentice Hall Of India
2. Introduction To C Programming, Reema Thareja, Oxford University Press
3. E. Balaguruswamy, Programming In Ansi C, Tata Mcgraw-Hill

**COURSE OUTCOMES**
The student will

1. Have the ability to **describe** a formal algorithmic solution for the given problem, **list** the features of C including scalar & vector data types, operators, **Outline** expressions, expression evaluation, operator precedence, sequential, conditional & iterative constructs.

2. Have the ability to **describe** one and two-dimensional arrays, **outline** loops and arrays for searching and **describe** various sorting techniques.

3. Have the ability to **outline** the purpose of functions, pointers, command line arguments, dynamic memory allocation. **Define** storage classes. **Describe** command like arguments, structures, unions, and enumeration. Have knowledge of handling files.

4. Have the ability to **solve** complex expressions, **design** algorithms and **develop** programs in C language using the basic constructs, data types, operators, control & iterative statements, and arrays.

5. Have the ability to **apply** arrays to solve complex matrix related problems and strings. **Compare and contrast** various searching and sorting techniques for complexity.

6. Have the ability to **distinguish between** function call types. **Draw inferences on** command line arguments, storage classes, and pre-processor directives. **Use** pointers with functions, arrays, strings, to **solve** complex problems. **Give example** and **solve** classical recursion problems. **Compare and contrast** static and dynamic memory allocation, and **apply** them. **Use** structures and unions to implement and **solve** real-time problems. **Apply** file related functions to process files.

7. Have the ability to **Fully appreciate** the art of procedural programming in C and develop programs **optimally** using the full feature set of C language.
**Course Title:** Programming for problem solving (Common to ALL Branches)  
**Course Code:** A3CIT201  
**Course Designed by:** Dept. of Computer Science and Engineering

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**Levels of Correlation:** High-3, Medium-2, Low-1
SYLLABUS

UNIT-I
Overview of Computer Graphics:
Computer technologies that impact on graphical communication, Demonstrating knowledge of CAD software (such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.
Set up of the drawing page and the printer, Scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing.
Applying dimensions to objects, applying annotations to drawings;

UNIT-II
Layers: Setting up and use of Layers, layers to create drawings, create, edit and use customized layers, concept of view ports.

Introduction to Orthographic Projections: Projections of Points; Projections of Straight Lines parallel to both planes; Projections of Straight Lines-Parallel to one and inclined to other plane.

UNIT-III
Projections of Straight Lines and Planes: Lines inclined to both planes, determination of true lengths, angle of inclinations and traces, Projections of Planes

UNIT-IV
Projections and sections of solids: Projections of simple solids- Sections of solids

UNIT-V
Development of surfaces, Isometric Projection and Conversion of Isometric Views to Orthographic Views: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa

TEXT BOOKS
1. DM Kulkarni, AP Rastogi, AK Sarkar “Engineering graphics with Auto CAD” PHI Publishers

REFERENCE BOOKS
4. CAD Software Theory and User Manuals.
COURSE OUTCOMES
At the end of the course the students will be able to:
CO1: Prepare two dimensional drawings using draw and modify commands in Auto CAD software and represent dimensions to the drawings
CO2: Clearly differentiate different types of projections and get solutions to projections of points in Auto CAD by applying the layers concept
CO3: Solve problems related to projections of straight lines and planes
CO4: Prepare simple solids in CAD software and obtain solutions to projections and sections of solids
CO5: Develop the surfaces of simple solids, prepare Isometric drawings and convert isometric drawings into orthographic views

CO/PO Mapping

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Course designed by: DEPARTMENT OF MECHANICAL ENGINEERING

Approval
Approved by: Meeting of Board of Studies held on 29-06-2019
LIST OF EXPERIMENTS

2. Determination of the thickness of the thin object (hair/paper) by Wedge method.
3. Determination of the prominent spectral line wavelengths in mercury spectrum by normal incidence method.
4. Obtain the signature variation of the axial magnetic field for a circular coil carrying current.
5. Estimation of the hysteresis loss for a ferromagnetic material.
6. Determination of thermal conductivity coefficient of the disc shaped material.
7. Determination of energy band gap of the semiconductor by using junction diode.
8. To plot I/V Characteristics of Zener diode.
10. To plot frequency response characteristics of the L.C.R series circuit.

TEXTBOOKS:

REFERENCES:

COURSE OUTCOMES:
CO1. Design experiments to demonstrate and investigate the interference and diffraction patterns of light.

CO2. Design experiments for signature variation of magnetic field due to current and the hysteresis loss in magnetic materials.

CO3. Design experiment to determine the thermal conductivity coefficient \((K)\) of a material.

CO4. Design L.C.R series circuits for desired applications based on their frequency response characteristics.

CO5. Design experiments for determining the physiognomies of the semiconductor devices like the energy band gap, breakdown voltage and coefficient of resistance.
**CO/PO MAPPING:**

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Course designed by DEPARTMENT OF PHYSICS

Approval

Approved by: Meeting of Board of Studies held on 29.06.2019
WEEK 1:
Objective: Getting familiar with the programming environment on the computer and writing the first program.
Suggested Experiments/Activities:
Tutorial 1: Problem-solving using computers
Lab1: Familiarization with programming environment
   i) Exposure to Turbo C, gcc, Code Blocks IDE
   ii) Writing simple programs using printf(), scanf()

WEEK 2:
Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.
Suggested Experiments/Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts
Lab1: Converting algorithms/flowcharts into C Source code
Developing the algorithms/flowcharts for the following sample programs
   i. Sum and average of 3 numbers
   ii. Conversion of Fahrenheit to Celsius and vice versa
   iii. Simple interest calculation

WEEK 3:
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.
Suggested Experiments/Activities:
Tutorial 3: Variable types and type conversions:
Lab 3: Simple computational problems using arithmetic expressions
   i) Finding the square root of a given number
   ii) Finding compound interest
   iii) Area of a triangle using heron’s formulae
   iv) Distance travelled by an object

UNIT – II

WEEK 4:
Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.
Suggested Experiments/Activities:
Tutorial 4: Operators and their precedence and associativity:
Lab 4: Simple computational problems using the operator’s precedence and associativity
   i) Evaluate the following expressions
      a. A+B*C+(D*E)+F*G
      b. A/B*C-B+A*D/3
   ii) a. A+++B---A
b. \( J = (i++) + (++i) \)

iii) Find the maximum of three numbers using conditional operator
iv) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5:
**Objective:** Explore the full scope of different variants of “if construct” namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for “if construct”.

**Suggested Experiments/Activities:**

**Tutorial 5:** Branching and logical expressions:

**Lab 5:** Problems involving if-then-else structures

i) Write a C program to find the max and min of four numbers using if-else

ii) Write a C program to generate electricity bill

iii) Find the roots of the quadratic equation

iv) Write a C program to simulate a calculator using switch case

v) Write a C program to find the given year is a leap year or not

WEEK 6:
**Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

**Suggested Experiments/Activities:**

**Tutorial 6:** Loops, while and for loops:

**Lab 6:** Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop

ii) Find the given number is a prime or not

iii) Compute sine and cos series

iv) Checking a number palindrome

v) Construct a pyramid of numbers

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**UNIT – III**

WEEK 7:
**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

**Suggested Experiments/Activities:**

**Tutorial 7:** 1D Arrays: searching

**Lab 7:** 1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array

ii) Perform linear search on 1D array

iii) The reverse of a 1D integer array

iv) Find 2’s complement of the given binary number

v) Eliminate duplicate elements in an array

WEEK 8:
**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that
will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

**Suggested Experiments/Activities:**
*Tutorial 8:* 2D arrays, Sorting and Strings  
*Lab 8:* Matrix problems, String operations, Bubble sort

1. Addition of two matrices  
2. Multiplication two matrices  
3. Sort array elements using bubble sort  
4. Concatenate two strings without built-in functions  
5. Reverse a string using built-in and without built-in string functions

**UNIT-IV**

**WEEK 9:**  
**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

**Suggested Experiments/Activities:**
*Tutorial 9:* Functions, call by value, scope and extent,  
*Lab 9:* Simple functions using call by value, Solving differential equations using Eulers theorem

1. Write a C function to calculate NCR value  
2. Write a C function to find the length of a string  
3. Write a C function to transpose of a matrix  
4. Write a C function to demonstrate numerical integration of differential equations using Euler's method

**WEEK 10:**  
**Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

**Suggested Experiments/Activities:**

*Tutorial 10:* Recursion, the structure of recursive calls  
*Lab 10:* Recursive functions

1. Write a recursive function to generate Fibonacci series  
2. Write a recursive function to find the lcm of two numbers  
3. Write a recursive function to find the factorial of a number  
4. Write a C Program to implement Ackermann function using recursion  
5. Write a recursive function to find the sum of series.

**WEEK 11:**  
**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

**Suggested Experiments/Activities:**
*Tutorial 11:* Call by reference, dangling pointers  
*Lab 11:* Simple functions using Call by reference, Dangling pointers

1. Write a C program to swap two numbers using call by reference  
2. Demonstrate Dangling pointer problem using a C program
iii) Write a C program to copy one string into another using pointer
iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

UNIT – V

WEEK 12:
Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc(), calloc(), realloc() and free() functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:
Tutorial 12: Pointers, structures and dynamic memory allocation
Lab 12: Pointers and structures, memory dereference

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

WEEK 13:
Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly-linked lists) and nested structures

Suggested Experiments/Activities:
Tutorial 12: Bitfields, Self-Referential Structures, Linked lists
Lab 12: Bitfields, linked lists

i) Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields
ii) Create and display a singly linked list using self-referential structure
iii) Demonstrate the differences between structures and unions using a C program
iv) Write a C program to shift/rotate using bitfields
v) Write a C program to copy one structure variable to another structure of the same type.

WEEK 14:
Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:
Tutorial 14: File handling:
Lab 14: File operations

i) Write a C program to write and read text into a file
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file
iv) Write a C program to merge two files into the third file using command-line arguments
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.
TEXTBOOKS:

REFERENCES:
2. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

COURSE OUTCOMES

**CO1.** Demonstrate the ability to write a formal algorithmic solution for the given problem, name & explain the features of C like types including scalar & vector types, operators, expressions, expression evaluation, operator precedence, sequential, conditional & iterative constructs.

**CO2.** Implement one and two-dimensional arrays to solve simple mathematical and matrix related problems. Make use of loops and arrays for searching and Compare various sorting techniques.

**CO3.** Identify the purpose of functions, pointers, command line arguments, dynamic memory allocation. Define storage classes. Understand command like arguments, structures and unions. Have knowledge of handling files.

**CO4.** Design algorithms and develop programs in C language using the basic constructs, data types, operators, control statements, and arrays.

**CO5** Apply pointers, functions, derived data types, and dynamic memory allocation, design solutions to challenging problems.

**CO6** Illustrate the art of procedural programming in C and develop programs optimally using the full feature set of C language.

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Levels of Correlation: High-3, Medium-2, Low-1

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| SEMESTER - I | 2 | - | - | 0 |
| CONSTITUTION OF INDIA | | | | Total Contact Hours – 30 |

SYLLABUS

UNIT – I: HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History - Drafting Committee, (Composition & Working)

UNIT – II: PHILOSOPHY OF THE INDIAN CONSTITUTION: Preamble - Salient Features


UNIT-IV: ORGANS OF GOVERNANCE: Parliament - Composition - Qualifications and Disqualifications - Powers and Functions - Executive - President - Governor - Council of Ministers; Judiciary, Appointment and Transfer of Judges, Qualifications. 


TEXT BOOK:
Reference Source compilation

REFERENCES:
1. The Constitution of India, 1950 (Bare Act), Government Publication.

COURSE OUTCOMES:

CO1. Students will be able to discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2. Students will be able discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3. Students will be able to discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO4. Students will be able to discuss the passage of the Hindu Code Bill of 1956.

CO5. Students will be able to discuss the powers of Executive, Judiciary and Legislature.
### CO/PO Mapping

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***
SYLLABUS

UNIT-I: RANDOM VARIABLES & PROBABILITY DISTRIBUTIONS

Random Variables: Discrete and continuous random variables, properties of mass and density functions. Mathematical Expectation: Properties (statements), Moment Generating Function; Outlines: of Binomial and Poission distributions; Normal Distribution: Probability density function, Normal approximation to Binomial Distribution, Parameters of Normal Distribution(statements), Characteristics of normal distribution, Area under normal curve, Standard normal distribution.

UNIT- II: STATISTICAL METHODS

Curve fitting by least squares method: Bi-variate data, scatter diagram, method of least squares, normal equations, fitting of straight line, second degree curve (parabola), exponential and power curves; Correlation: types of correlation, measures of correlation, Karl Pearson coefficient of correlation and its properties; Regression Analysis: Regression Coefficients and its Properties, Regression lines.

UNIT-III: SAMPLING DISTRIBUTIONS AND TESTING OF HYPOTHESIS (LARGE SAMPLES)

Sampling distributions: population, sample, population parameters, sample statistic and types of sampling, sampling distribution of means (with and without replacement), standard error. Testing of hypothesis (large samples): Statistical hypothesis, null hypothesis, alternative hypothesis, type-I and type-II errors, critical region, level of significance, one tailed and two tailed tests.

Large Sample tests: Z-test for single mean and difference of means, single proportion and difference of proportions.

UNIT-IV: TESTING OF HYPOTHESIS (SMALL SAMPLES)

Testing of hypothesis (small samples): Introduction to small sample tests, degrees of freedom, Student's t, F and Chi-square distributions; student's t-test: t-test for single mean, difference of means and paired t-test; Chi-square test: Goodness of fit, independence of attributes, F-test: equality of population variances.

UNIT-V: QUEUING THEORY

Introduction to Queuing Models: Introduction to stochastic process, states space, Markovian's property, Input pattern, service pattern, queue discipline, Queue behavior, Kendal’s notation, Pure Birth and Death Models, Traffic intensity; (M/M/1: ∞/FIFO)-Model: Average System length, Average queue length, Average waiting time and related probabilities; (M/M/: N/FIFO)-Model: Average system length, average queue length, average waiting time and related probabilities.

TEXT BOOKS:
1. RE Walpole, SL Mayeres & K May, Probability and Statistics for Engineers & Scientists, 3/e, Pearson Publishers

**REFERENCE BOOKS:**

**COURSE OUTCOMES:**
At the end of course, students shall be able to:

- **CO 1** Recall the concepts of random variables, probability distributions and statistical methods.
- **CO 2** Recall the concepts of Sampling distributions and testing of hypothesis (large samples).
- **CO 3** Recall the concepts of testing of hypothesis (small samples), stochastic processes and queuing models.
- **CO 4** Understand and interpret the concepts of random variables, probability distributions and statistical methods.
- **CO 5** Understand and interpret the concepts of Sampling distributions and testing of hypothesis (large samples).
- **CO 6** Understand and interpret the concepts of testing of hypothesis (small samples), stochastic processes and queuing models.
- **CO 7** Apply the tools of probability and statistics to real world problems.

**CO/PO Mapping**

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**Course designed by DEPARTMENT OF MATHEMATICS**

**Approval**
- Approved by: Meeting of Board of Studies held on 06.07.2019
ENGINEERING CHEMISTRY (Common to all branches)  

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Total Contact Hours – 48

SYLLABUS

UNIT 1: WATER TECHNOLOGY
Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT 2: POLYMERS
Introduction to polymers, functionality of monomers, addition and condensation polymerization, copolymerization, stereospecific polymerization with specific examples. Thermoplastics and Thermo-sets – their differences.
Elastomers – applications with specific examples- Preparation, properties and uses of PVC, Bakelite, Teflon and Nylon-6, 6, Buna-S and Thiokol rubber- Fibre reinforced plastics – carbon fibre, glass fibre and aramids.

UNIT 3: ELECTROCHEMISTRY AND APPLICATIONS
Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations. Primary cells – dry cell- Secondary cells – lead acid, nickel-cadmium and lithium ion batteries- working of the batteries including cell reactions- Fuel cells, hydrogen-oxygen, and methanol fuel cells – working of the cells.

UNIT-4: CHEMISTRY OF ADVANCED MATERIALS
NANOMATERIALS: introduction- synthesis of Nano material by sol gel method- CVD-engineering applications of Nano materials
CEMENT: Introduction to ordinary Portland cement- manufacturing of OPC- setting and hardening of cement- decay of cement.
FUELS: Introduction- classification- liquid fuels- cracking- knocking- octave number and cetane number; Lubricants- definition- mechanism and properties of lubricants

UNIT 5: INSTRUMENTAL METHODS AND APPLICATIONS
Electromagnetic spectrum. Absorption of radiation: Beer-Lambert’s law. Principle, instrumentation (Block diagram and working), applications of UV, IR and NMR spectroscopic methods. Chromatography- introduction- Ion exchange chromatography- applications
COURSE OUTCOMES:

CO1: The student will have the ability to describe softening methods and desalination processes. He/She will be able to explain various types of polymers; preparation, properties and engineering applications of thermoplastic, thermosetting plastics, rubbers and FRP’s.

CO2: The student will have the ability to describe electrochemical reactions, principles of batteries, fuel cell and corrosion.

CO3: The student will have the ability to outline electromagnetic spectrum and explain the working principles of IR, UV, NMR and chromatographic techniques. The student describes the synthesis, properties and applications of nanomaterials, cement. He/She Outlines the cracking methods, knocking of fuels.

CO4: The student will have the ability to differentiate between hard and soft water, demineralization and deionization processes and thermosetting – thermoplastic materials.

CO5: The students will have the ability to give examples on primary and secondary batteries, various types of corrosion, methods of corrosion prevention.

CO6: The student will have the ability to draw inferences on the principles and applications of various instrumental methods and also can compare and contrast between cracking methods.

CO7: The student will have the ability to analyze water samples and validate the results obtained and apply their knowledge on polymers, batteries, materials and instrumentation.

Text books:

Reference books:

CO/PO Mapping

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| Approval          | **Approved by:** Meeting of Board of Studies held on 29.06.2019  
SYLLABUS

UNIT 1: D.C. CIRCUITS
Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff’s current and voltage laws, Analysis of simple circuits with DC excitation, Superposition, Thevenin’s and Norton’s Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT 2: A.C. CIRCUITS
Representation of sinusoidal waveforms, Average and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase AC circuits (Series & Parallel), Resonance, Three-phase balanced circuits, voltage and current relations in star and delta configurations.

UNIT 3: DC & AC MACHINES [ELEMENTARY TREATMENT ONLY]

UNIT 4: BASICS OF POWER SYSTEMS:

UNIT 5: ELECTRICAL INSTALLATIONS
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing, Types of Batteries, Characteristics of Batteries. Elementary calculations for energy consumption, power factor improvement, battery backup.

TEXT BOOK/ REFERENCES:


COURSE OUTCOMES:

At the end of the course, Student will be able to
CO1. To recall fundamental concepts of electrical circuits such as charge, voltage, current and power.
CO2. Describe the principle of operation of D.C. & A.C. machines.
CO3. Outline the working operation of various generating stations.
CO4. Explain the procedure for solving circuits with A.C and D.C. Excitation
CO5. Summarize the performance characteristics of different machines.
CO6. Explain about different equipment used in power industry
CO7. Apply the fundamental laws, associated with Basic Electrical Engineering to solve real world problems in the field of Engineering
### CO/PO Mapping

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<th>CO / PO mapping</th>
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**Course designed by:** Department of Electrical & Electronics Engineering

**Approval**

Approved by: Meeting of Board of Studies held on 29.06.19

SYLLABUS

UNIT – I: BASIC LANGUAGE SKILLS – A REFRESHER
Organs of Speech: Consonant Sounds & Vowel Sounds; Phonemic Transcription; Using a Dictionary to know the Pronunciation of a word
Presenting Oneself: Introducing oneself -Using different expressions in Formal & Informal Contexts.
Reading a News Article: Identifying the key words and their usage; summarizing the information
Word Study & Mind Mapping: Root words–Derivatives; Homonyms, Homographs, Homophones; Synonyms & Antonyms

UNIT – II: RUDIMENTS OF FUNDAMENTAL COMMUNICATION
The World: Listening & watching Documentaries on World famous Places.
Short Story Corner: Reading a short story – Understanding the mood and essence – Sharing different perspectives.
Sentence Patterns: Concord – Rules – Common errors in day-day usage

UNIT-III: COMMUNICATION AT PRACTICE
Oratory Skills: Listening to World’s Famous Speeches
JAM (Just a Minute) Talk: Format & Delivery Techniques
Nuances of Language: Company Description –Position Description (Formal) – processes like Chocolate Making (Informal).
Types of Sentences – Declarative, Interrogative, Assertive etc.

UNIT-IV: COMMUNICATION THROUGH CONCEPTUAL LEARNING
BBC English: Watching interviews of Famous people.
Dialogue Practice: Situational Dialogues; Structuring a Role Play
New Inventions: Reading about latest technology pertaining to different fields (Source: Science Journals)

UNIT – V: COMMUNICATION THROUGH LIFE SKILLS
Watching Movies for Language Enrichment & Writing Reviews.
Skits: Enacting a Skit on a Social Issue
Reflections: Reading News Paper Editorial columns, Literacy Reviews, Poetry
Presenting an autobiography: Exploring different styles of writing autobiographies and evolving an own style.

TEXT BOOK:
Reference Source Compilation by the Department
REFERENCES:
1. Fundamentals of Technical Communication by Meenakshi Raman, OUP.
3. English Made Easy by Mary Margaret Hosler, McGraw Hill.
5. The Oxford Guide to Writing and Speaking by John Seely, OUP

COURSE OUTCOMES:

CO1. Student will be able to come to terms with the basic language Skills required to cater to the requirement of the programme undertaken.

CO2. Student will be able to comprehend and analyze the core concepts well.

CO3. Student will be able to gain proficiency in all four skills of Language – Listening, Reading, Speaking and Writing.

CO4. Student will be able to understand the Syntactical and Grammatical Components of English Language and their correct use.

CO5: Student will be able to present his/her ideas confidently in a Professional manner.

CO/PO Mapping

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<th>Course Title:</th>
<th>Essential Communication in English</th>
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Course designed by DEPARTMENT OF ENGLISH & HUMANITIES
Approval
Approved by: Meeting of Board of Studies held on 29.06.19
List of Experiments:
1. Determination of HCl using sodium carbonate
2. Determination of Hardness of a groundwater sample.
3. pH metric titration of strong acid vs. strong base
4. Conductometric titration of Strong acid VS Strong base
5. Conductometric titration of Weak acid VS strong base
6. Potentiometric titration of Fe(II) with potassium dichromate
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of a polymer
9. Determination of viscosity of polymer solution using survismeter
10. Determination of percentage of Iron in Cement sample by colorimetry
11. Estimation of Calcium oxide in Portland cement
12. Preparation of Nanomaterials (ex: Fe/Zn/Ferrite)
13. Adsorption of acetic acid by charcoal
14. Determination of acid value and saponification value of a given lubricant
15. Project based learning (Mandatory for all students)

Course Outcomes:
CO1: The student will be able to determine total hardness, strength of acid in a lead acid battery, calcium in Portland cement using volumetric analysis
CO2: The student will be able to explain conductometric, potentiometric, pH metric titrations and colorimetric determination.
CO3: The student will be able to explain the synthesis of a polymer, nanomaterials

Course designed by
Course Title: Engineering Chemistry
Course Code: A3CYI101
Course Designed by Dept. of Chemistry

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LIST OF EXPERIMENTS

Basic safety precautions, Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope, resistors, capacitors and inductors.
1. Verification of Kirchhoff laws.
2. Verification of Network Theorems.
3. Magnetization characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. Predetermination of performance parameters of 1 – Phase Transformer.
6. I – V Characteristics of Solar PV cell
7. Brake test on DC Shunt Motor.
10. Measurement of Choke coil parameters
11. Brake test on 3 - Phase Induction Motor.
12. Determination of AC quantities using CRO/DSO.
13. I – V characteristics of battery.

COURSE OUTCOMES:
At the end of the course, Student will be able to

CO 1. Identify common electrical equipment used in laboratory. (L1)
CO 2. Estimate the ratings of different equipment used to perform an experiment. (L2)
CO 3. Demonstrate the usage of various electrical measuring instruments. (L3)
CO 4. Analyze the characteristics of rotating & stationery electrical machines (L4).
CO 5. Interpret the characteristics of PV cell and Battery. (L5)

CO/PO Mapping

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</table>
UNIT 1: COMPUTER HARDWARE

Types of Computing Devices such as PC, Laptops, Servers, Smart Phones, Tablets, other accessories, PC parts, Input/Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Unit Outcomes:
Student should be able to
1. Identify various kinds Computing devices and their components.
2. Identify the different peripherals, ports and connecting cables in a PC.
3. Assemble and disassemble components of a PC

References:
1. Introduction to computer-peter Norton

UNIT 2: OPERATING SYSTEMS

Virtual Machine setup:
- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Operating System installation:
- Installing an Operating System such as Linux on Computer hardware.

Linux Operating System commands:
- General command syntax
- Basic help commands: whatis, man, info
- Filesystem: ls, mkdir, cd, touch, chmod, rm, mv, bc, finger, who, whoami, ps, du, df
- Date and Time: cal, date,
- Filters and Text processing: echo, cat, tac, rev, more, less, head, tail, nl, cut, paste, wc, sort, uniq, cp, cmp, diff, tr, ln, grep, fgrep, egrep, sed, awk, find, xargs, tee,
- File compression: tar, compress, uncompress, split, uuencode, uudecode, gzip, gunzip, read, expr, test, ping, ssh
- Miscellaneous: apt-get, vi editor
- Shell I/O redirection and piping, regular expressions, simple shell programs without control structures.
- Search for “20 examples of grep in linux” and practice like this on all the given commands.

https://www.pcsuggest.com/basic-linux-commands/
https://www.linuxtechi.com/25-find-command-examples-for-linux-beginners/
Unit Outcomes:
Student should be able to:
1. construct a fully functional virtual machine
2. summarize various linux operating system commands

References:
7. https://www.pcsuggest.com/basic-linux-commands/

UNIT 3: NETWORKING AND INTERNET

Networking Commands:
- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget, route

Internet Services:
- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Google search techniques (text based, voice based)
- Alexa website traffic statistics
- Email creation and usage
- google hangout/skype/gotomeeting video conferencing
- archive.org for accessing archived resources on the web
- Creating a Digital Profile on LinkedIn, Twitter, Github

Unit Outcomes:
Students should be able to
1. resolve internet connectivity issues
2. secure a computer from cyber threats
3. apply google search techniques
4. create their own digital profile on social media
UNIT 4: PRODUCTIVITY TOOLS

Productivity Tools:
- archival and compression tools
- scanning and image editing tools
- photography with digital camera and photo editing tools
- OCR and text extraction
- audio players, recording using Mic, editing, podcast preparation
- video players, recording using webcam/camcorder, editing
- podcast, screencast, vodcast, webcasting

Unit Outcomes:
Students should be able to:
1. archive and unarchive data on the file system using relevant compression tools
2. edit photos & images in various formats using photo & image editing tools
3. recognize characters & extract text from scanned images
4. create audio files and podcasts
5. create video tutorials and publishing

References:
2. Image editing: https://en.wikipedia.org/wiki/Image_editing
   Comparison of raster graphics editors: https://en.wikipedia.org/wiki/Comparison_of_raster_graphics_editors
4. Audio editing software: https://en.wikipedia.org/wiki/Audio_editing_software
   Comparison of free software for audio: https://en.wikipedia.org/wiki/Comparison_of_free_software_for_audio
5. Video editing software: https://en.wikipedia.org/wiki/Video_editing_software
   Comparison of video editing software: https://en.wikipedia.org/wiki/Comparison_of_video_editing_software
UNIT 5: OFFICE TOOLS

Cloud based productivity enhancement and collaboration tools:

- Store, sync, and share files with ease in the cloud
  - Google Drive

- Document creation and editing text documents in your web browser
  - Google Docs

- Handle task lists, create project plans, analyze data with charts and filters
  - Google Sheets

- Create pitch decks, project presentations, training modules
  - Google Slides

- Manage event registrations, create quizzes, analyze responses
  - Google Forms

- Build public sites, internal project hubs
  - Google Sites

- Web-based service providing detailed information about geographical regions and sites around the world. Explore the globe by entering addresses and coordinates
  - Google Maps and Earth

- Online collaboration through cross-platform support
  - Jamboard

- Keep track of important events, sharing one's schedule, and create multiple calendars.
  - Google Calendar

Unit Outcomes:

Students should be able to:
1. use office tools for documentation
2. build interactive presentations
3. navigate through the globe
4. build websites
5. create quizzes & analyze responses

References:
2. G Suite Learning Center: https://gsuite.google.com/learning-center/products/#!/
COURSE OUTCOMES

Students should be able to
1. Identify various computing devices and functional parts of a PC by assembly and disassembly
2. Construct a functional virtual machine and summarize various Linux operating system commands
3. List various networking commands and secure an individual PC or a network from cyber threats
4. Apply Google search techniques, create their own digital profile on social media
5. Edit Multimedia using various tools for image, audio and video processing
6. Use office tools for documentation and building interactive presentations
7. Use social networking for information gathering and online collaboration

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Course designed by DEPARTMENTS OF CSE & IT

Approval
Approved by: Meeting of Board of Studies held on 29-06-2019.
SYLLABUS

UNIT I : Managerial Economics & Demand Analysis:


UNIT II: Production Function and Cost Analysis:


UNIT III : Market Structures, Pricing Policies and Business Environment

Market structures: Types of competition – Features of Perfect, Monopoly, Monopolistic, oligopoly Competition. Pricing Strategies and Methods – Cost plus pricing, Penetration Pricing and Price Skimming, Two part pricing, Block and Bundle pricing, Peak load pricing.

Business Environment:

UNIT IV: Basics of Financial Accounting


UNIT V: Financial Analysis

Objectives and Need of financial statements analysis, Ratio analysis: Managerial uses of Ratio Analysis - Types of Ratios: Liquidity Ratios- Current ratio and Quick ratio. Solvency Ratios- Debt to Equity Ratio, Proprietary Ratio and Interest Coverage Ratio. Activity Ratios- Inventory Turnover Ratio, Debtors turnover ratio, Creditors turnover ratio - Profitability Ratios-Gross and Net Profit Ratio. (Theoretical Description)
Course Outcomes:

1. KO#1: Students shall be able to Describe the basic concepts of managerial economics, demand analysis, production function and cost analysis
2. KO#2: Students shall be able to State the different types of market structures, pricing policies. Describe the various factors affecting business environment.
3. KO#3: Students shall be able to Outline the basic concepts of accounting and financial statements analysis.
4. UO#1: Students shall be able to Explain the basic concepts of managerial economics, demand analysis, production function and cost analysis.
5. UO#2: Students shall be able to Compare and Contrast different types of market structures, pricing policies and various factors affecting business environment.
6. UO#3: Students shall be able to Illustrate the basic concepts of accounting and financial statements analysis.
7. AO#1: Students shall be able to Apply and bring to bear the full complement of concepts of Managerial Economics and Financial Analysis to solve a problem in real time business scenario.

Text books:

3. John Dean, Managerial Economics, PHI

References:

3. Suma Damodaran, Managerial Economics, Oxford University Press.
9. Truet and Truet: Managerial Economics: Analysis, Problems and cases ,Wiley

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SYLLABUS

Unit - I: HRM, Selection, Training & Development
Training & Development: Training & Development – Objectives & Importance; Types of Employee Training; Performance Appraisal; Incentives;

Unit – II: Personality and Perception & Motivation
Personality: Personality Definition & Determinants; Key personality traits relevant to work behavior; Personality Types; Contrasting Personality traits, Tolerance to ambiguity & role of personality;
Perception & Motivation: Factors affecting perception; Perception & its application in organization; Introduction to Motivation & Maslow’s Hierarchy of Needs; Herzberg two factor theory of Motivation, ERG Theory;

Unit – III: Communication, Groups, Leadership & Conflict Communication:
Elements of Communication; Types of Communication; Functions & Barriers of Communication; Techniques for overcoming barriers of Communication;
Groups: Types of Groups, Reasons for joining Groups; Stages of Group Development; Group Cohesion; Group decision making, types of teams & team building;
Leadership: Styles of Leadership, Theory of Leadership; Leadership style assessment; Theory of Leader effectiveness, model of situation leadership; Inspirational approaches to Leadership;
Conflict: Types of conflict; Conflict process; Conflict Management Techniques; Transactional Analysis;

Unit – IV: Organizational Behavior and Learning Organizational Behavior:
Key elements and basic approaches of Organizational Behavior; Organizational Behavior Concepts needed by Managers; Models of Organizational Behavior - Autocratic and Custodial; Models of Organizational Behavior - Supportive, Collegial, System;
Learning: Learning Process & Factors affecting Learning; Classic Conditioning Theory & Applications; Operant Conditioning & Applications; Cognitive Learning & Social Learning Theories;

Unit – V: Organizational Culture, Change Management & International Organizational Behavior
Organizational Culture: Features of Organizational Culture; Organizational change; Individual resistance to change; Organizational resistance to change;

Change Management & International Organizational Behavior: Overcoming resistance to change; Lewin’s model of change; Individual behavior in international organization; Group behavior in international organization;

Text Books:
1. Gary Dessler.0,” FUNDAMENTALS OF HUMAN RESOURCE MANAGEMENT”, Pearson, Noida, India,2017

Course Outcomes:
1. KO#1: have the ability to outline and describe Human Resource Management & Selection, Training & Development, Personality, and Perception & Motivation;
2. KO#2: have the ability to outline and describe Communication, Groups, Leadership, and Conflict;
3. KO#3: have the ability to outline and describe Organizational Behavior, Learning, Organizational culture, and International organizational behavior;
4. UO#1: have the ability to draw inferences on Human Resource Management & Selection, Training & Development, Personality, and Perception & Motivation;
5. UO#2: have the ability to draw inferences on Communication, Groups, Leadership, and Conflict;
6. UO#3: have the ability to draw inferences on Organizational Behavior, Learning, Organizational culture, and International organizational behavior;
7. AO#1: have the ability to apply and bring to bear the full complement of concepts and practices of Human Resource Management and Organizational Behavior to better appreciate organizational cultures and optimize individual productivity.

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<td>Ratified by: Meeting of academic council held on 11.07.2020</td>
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Syllabus

Unit-I: Mathematical Logic & Statement Calculus 09 Hours

Statements and Connectives: statements, connectives, compound statements (Formulas), well-formed formulas, truth tables, tautologies, equivalence of formulas, converse, contrapositives & inverse of an implication, duality law, tautological implications; Normal forms: Principal disjunctive and conjunctive normal forms; Statement calculus: Validity of an argument using truth tables and rules of inference, consistency of premises, indirect method of proof.

Unit-II: Predicates & Predicate Calculus 08 Hours

Predicate calculus: Predicates, statement of functions, variables and quantifiers, predicate formulas, free and bound variables, universe of discourse, valid formulas and equivalences involving quantifiers, rules of inference, theory of inference for predicate calculus

Unit-III: Combinatorics, Set Theory, Posets and Lattices 07 + 07 Hours


Partial ordering: Partial order relation, partially ordered set (poset), chain, representation and associated terminology such as Hasse diagram, least upper bound, greatest lower bound and well ordering; Lattices: Lattice as partially ordered set, Properties: Idempotent, commutative, associative, absorption, isotonic and Distributive and modular inequalities

Unit-IV: Algebraic Structures 09 Hours

Algebraic Systems (Structures): Binary operation, algebraic structures such as Semi group, Monoid, Group, commutative group with suitable examples, properties satisfied by the algebraic structures and the elements; Special group structures: Sub group and its criteria, order of an element, Cosets, index of sub group, properties of cosets, order of a group, Lagrange’s theorem

Unit-V: Recurrence Relations & Generating Functions 08 Hours

Recurrence Relations: Formation, iterative method of solving recurrence relations, solving homogeneous and non-homogeneous recurrence relations by characteristic roots method; Generating Functions: Generating functions of sequences, calculation of coefficients of expansions, solving recurrence relations by generating functions
Text Books:


TB2 S. Santha and E V Prasad, Mathematical Foundations for Computer Science, CENGAGE Publishers

Reference Books:


RB2 Dr. D S Chandrasekhararaiah, Mathematical Foundations of Computer Science, Prism Book Pvt Ltd.


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

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<tr>
<th>CO</th>
<th>KO-1</th>
<th>Recall the concepts of Mathematical logic and statement &amp; predicate calculus</th>
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<tr>
<td>CO</td>
<td>KO-2</td>
<td>Recall the concepts of combinatorics, set theory, posets and lattices</td>
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<td>KO-3</td>
<td>Recall the concepts of algebraic structures, recurrence relations and generating functions</td>
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<td>UO-1</td>
<td>Use and interpret the concepts of Mathematical logic and statement &amp; predicate calculus</td>
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<td>CO</td>
<td>UO-2</td>
<td>Use and interpret the concepts of Predicate Calculus, set theory, posets and lattices</td>
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<tr>
<td>CO</td>
<td>UO-3</td>
<td>Use and interpret the concepts of algebraic structures, recurrence relations and generating functions</td>
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<td>CO</td>
<td>AO-1</td>
<td>Apply the concepts of discreet mathematical structures to computer science and engineering</td>
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CO/PO Mapping

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Course Designed by Dept. of Mathematics

Approval

Approved by Board of Studies (BoS) of Department of Mathematics in its 4th meeting held on 06.07.2019.

Ratified by Academic Council in its 5th meeting held on 13.07.2019.
SYLLABUS

UNIT 1: Introduction to Design Thinking

**Design Thinking in General:** The Concept of Design Thinking; Wicked Problems, The Principles and the mindset of Design Thinking, Generic Phases of Design Thinking process and activities involved in each of the phase, Design Thinking Frameworks.

**Design Thinking for New Product Development:** Role of Design Thinking in NPD, When to Apply Design Thinking and When Not to, StageGate Vs Lean Vs. Agile methodologies Vs Design Thinking, Design innovation.

UNIT 2: Problem Identification process in Design Thinking

**Empathize:** Empathize - Goals and methods, Usage of Tools (Design Briefs - Nine Criteria with example), Usage of Tools (Creation of Personas, Illustrative application of Personas), Student Activity on Empathize phase.

**Define:** Importance of Define Phase, activities, Usage of Tools (Experience Mapping process with example), Usage of Tools (Developing Insights using HMW Questions, question ladder), Student Activity on Define phase.

UNIT 3: Problem Solving Process in Design Thinking, Case Study discussion & implementation

**Ideate:** Importance of Ideate Phase, 77 Design Heuristics, Diverge Ideas, Converge Ideas Student Activity on Ideate phase


**Case Study Implementation:** Case Study - 1 (Problem Identification Processes in Design Thinking), Case Study - 1 (Problem Solving Processes in Design Thinking), Case Study - 2 (Problem Identification Processes in Design Thinking), Case Study - 2 (Problem Solving Processes in Design Thinking)

**Student implementing phases of DT towards Problem Solving:** Problem Area Identification , Application of Empathize Phase , Application of Empathize Phase, Case Study Evaluation Phase - 1
UNIT 4: Product Innovation

The Role of Design in Early-Stage Ventures: Introduction: An Emerging Start-up Culture, The Process: Winding from idea to product, Discussion on Case Study, Troubleshooting Common Mistakes

Optimal Design for Radically New Products: Introduction- six ideas and their implementation, Communicate the Challenge Goal toward Radically New Products; Shift Time Frames to Future and Past, Promote an Emerging Technology Focus across the Consumption Chain; Use of Analogical Thinking, Look for Novel Ways to Solve Simple Problems; Leverage More Ideators via Crowdsourcing

UNIT 5: Case Study implementation

Student implementing phases of DT towards Problem Identification & Solving
Application of Define Phase, Application of Define Phase, Case Study Evaluation Phase – 2, Application of Ideate Phase

Student implementing phases of DT towards Problem Identification & Solving
Application of Ideate Phase, Build Prototype, Test the solution, Case Study Evaluation Phase – 3

Textbooks:

1. Design think new product development essentials from the PDMA – Wiley edition
2. Product Design and Development Karl Ulrich (Author), Steven Eppinger – Fifth edition

References:

5. https://www.interaction-design.org/literature/article/design-thinking-a-quick-overview
Course Outcomes:

1. **KO#1**: Have the ability to describe various phases of Design Thinking and various tools for Empathizing in Design Thinking.

2. **KO#2**: Have the ability to describe various tools for Ideation, Prototyping in Design Thinking

3. **KO#3**: Have the ability to outline the Design process for new Product development in startups and techniques to design Radically New Products.

4. **UO#1**: Have the ability to give examples for empathize and define phases in Design Thinking

5. **UO#2**: Have the ability to give examples for Ideation, Prototyping in Design Thinking

6. **UO#3**: Have the ability to draw inferences on designing Radically New Products in emerging startups.

7. **AO#1**: Have the ability to apply Design Thinking principles, methodologies, phases and tools to design New/Radically new Process/Service/Product

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SYLLABUS:

UNIT – I: Introduction To Digital Systems

**Digital systems and Number systems**: Whole numbers: Non-decimal to decimal; Whole numbers: Decimal to non-decimal; Fractional Numbers: Non-decimal to decimal; Fractional Numbers: Decimal to non-decimal.

**Binary Arithmetic**: r’s complement and r-1’s complement, Signed number representations; Unsigned addition with overflow check, Un-signed subtraction; Signed addition/subtraction with overflow; Weighted and Non-weighted codes, Floating Point Representation

UNIT – II: Boolean Algebra

**Boolean Algebra and Logic gates**: Huntington’s postulates, Duality and Complement; Boolean Theorems; POS and SOP Canonical and Standard forms, NAND and NOR gates (AND and OR using NAND and NOR) – universal gates; Minimization (3 and 4 variables) given min terms or max-terms to Sum of Products, implement using universal gates

**Simplification of Boolean functions**: Minimization (3 and 4 variables) given min terms or max-terms to Product of sums, implement using universal gates; Minimization (3 and 4 variables) given min-terms and don’t cares to SOP or POS; Minimization (3 and 4 variables) given max-terms and don’t cares to SOP or POS; Q-M Method of Minimization (prime implicates method)

UNIT – III:

**PART 1: Combinational Logic Circuits**

**Combinational Logic**: Half & Full Adders, Half & Full Subtractors; Ripple Adders, Adder/Subtractor using complement method; Decoders & implementing Boolean functions using decoders; Encoders & Priority Encoders

**Medium Scale Integration Circuits (MSI)**: Multiplexers & implementing Boolean functions using multiplexers; De-Multiplexers, Multiplexer using decoder and tri-state buffers; Magnitude Comparator, carry look-ahead adder; Code Converters

**PART 2: Synchronous Sequential Logic & PLD’s**

**Sequential Logic**: Definition and classification of sequential circuits, Latches: SR latch, S’R’ Latch; Latches: S’R’ latch with enable, D Latch, Difference between Level Triggering and Edge-Triggering, Positive-edge and Negative-edge, Asynchronous Inputs, Master Slave Flip Flop Design; SR and D Flip-Flop; JK and T Flip Flop

**Programmable Logic Design**: Implement SR in any other Flip Flop; Conversion of D to JK and T Flip Flop; PROM and realization, PAL and realization; PLA and realization, Comparison between PROM, PLA, PAL
UNIT – IV: Registers, Counters And Variable Counters

Register and Counters: Control Buffer Registers; Universal Shift Register; Serial Transfer, Serial Addition with and without full adder; Binary synchronous up-counter with control, down-counter with control

Variable Counters: Binary synchronous up-counter with parallel load; BCD synchronous counter or any Mod-n synchronous counter; Ripple binary up-counter and Ripple binary down-counter; Ring Counter & Johnson Counter, handling unused states

UNIT – V: Asynchronous Sequential Logic

Introduction to Asynchronous Circuits: Description of Asynchronous circuits, Race Conditions; Analysis using Flow table, transition table; Critical & Non-Critical Races examples; Analysis of SR Latches

Design Procedure: Analysis of circuit without Latches; Analysis of circuit with latches; Design procedure for asynchronous circuits with Latches; Design Procedure for asynchronous circuits without Latches

Text Books:


References:


COURSE OUTCOMES

1. KO#1: Have the ability to deal with different number systems and perform basic arithmetic operations, explain in detail Boolean algebra operations, basic gates for implementing various Boolean operations, forms of representing Boolean expressions and minimizing them.
2. KO#2: Have the ability to describe, analyze and build combinational and sequential circuits and explore some of the most widely used combinational circuits and Programmable Logic Devices
3. KO#3: Have the ability to describe, analyze, and build standard synchronous sequential circuits like registers and counters and also describe the design procedure and issues involved in asynchronous sequential circuits.
4. UO#1: Grasp the significance of number systems and Boolean algebra to optimize simple circuits
5. UO#2: Grasp the significance of combinational circuit design and how they might be applied for designing circuits for any given problem and grasp the importance of sequential circuits, distinguishing them from combinational circuits
6. **UO#3**: Grasp the significance of Synchronous and Asynchronous sequential circuits and how they might be applied for designing circuits for a given problem.

7. **AO#1**: Fully appreciate the basics of logic design, digital gates to support basic Boolean operations and the process of designing different circuits for required logical functions that have state and no state

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SYLLABUS

UNIT- I: Introduction To Data Structures, Recursion, Sorting, Contiguous And Non-Contiguous Memory Allocation

Introduction: Data Structures- Introduction, Need for a data structure, Types of Data Structures, Introduction big O Notation, Recursion – Introduction, Types of recursion, Contiguous Memory allocation - Introduction to Arrays, Sorting Organizing elements in an array in sorted order – Merge Sort, Quick Sort.


UNIT –II: Double Linked List, Applications of Linked List

Double Linked List- Insertion, Deletion, Traversal / Search, Reversal of Single Linked List, Merging of 2 Linked List (Ordered / Unordered)
Applications of Linked List –Sparse Matrix, Polynomial Representation, Addition of 2 Polynomials, Contrast implementation of a list of user names using static and dynamic storage, Comparison of Arrays and Linked List.

UNIT- III:

PART 1: STACKS, QUEUES

Stacks: Introduction to stack data structure, Basic Operations, Implementation of Stack using array, Implementation of Stack using Linked List, Applications of Stack - Infix to postfix conversion, Evaluating Arithmetic expressions

Queues: Introduction to Queue, Basic Operations, Implementation of Queue using array, Implementation of Queue using Linked List, Circular Queue, Queue using Stacks, Double ended Queues

PART 2: Trees


UNIT- IV: Graphs

Graphs – Introduction, Types of Graphs, Graph properties, transpose of a Graph, Various ways of representing Graphs in memory, Operations on Graphs – Insertion, Deletion

Graph Algorithms -Traversals/Search – Breadth First and Depth First, Minimum Spanning tree using Prim’s algorithm, Minimum Spanning tree using Kruskal’s algorithm, Single Source Shortest Distance (Dijkstra’s shortest path)

UNIT- V: Heaps And Hashing

Heaps-Introduction to Heap, Types of Heap, Binary Heap -Creation of Heap, Operations – Insertion, Deletion, Heap Sort, Priority Queue

Hashing – Introduction, Types of Hash Functions, Collision Resolution techniques, double hashing, Rehashing

Text Books:

1. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage.
3. Data Structure with C, Seymour Lipschutz, TMH.

Reference Books:

COURSE OUTCOMES

1. **KO#1**: Have the ability to state basics operations on data structures and implement recursion, sorting methods and perform basic operations on Linked Lists (Knowledge)
2. **KO#2**: Have the ability to implement Stacks and Queues, use them in various applications (Knowledge)
3. **KO#3**: Have the ability to implement non-linear data structures like trees and graphs and implement hashing techniques (Knowledge)
4. **UO#1**: Have the ability to compare various sorting techniques and understand the use of various types of Linked Lists (Understanding)
5. **UO#2**: Have the ability to compare Stacks and Queues, and the purpose of using Linear Data Structures (Understanding)
6. **UO#3**: Have the ability to distinguish between the purpose of various non-linear data structures. (Understanding)
7. **AO#1**: Fully appreciate the art of different data structures and applying the knowledge of data structures to various applications. (Applying)

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SYLLABUS

UNIT-1 (Basics, Data Types, operators)


UNIT-2 (Loops, decision making and Functions)

Loops and Selection: if and if-else Statements, if-else Statements, While loop, range () function, for loop, nested loops, break, continue, program assignments on loops. Functions: Syntax and basics of function, use of a function, Parameters and arguments in a function local and global scope of variable, return statement, recursive function.

UNIT-3 (Strings, List- processing, Tuples and Dictionaries)

Strings- A String us a sequence, len, Traversal with for loop, String slice, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String Comparison. Lists- List is a sequence, Lists are mutable, traversing a list, List operations, List slice, List methods, Map filter and reduce, deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments. Tuples- Tuples are immutable, tuples assignment, Tuple as return values, Variable-length argument tuples, Lists and tuples, Dictionaries and Tuples, Sequence of Sequences. Dictionaries – A Dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and list, Memos, Global Variables.

UNIT-4 (File Handling)

Need of file handling, text input and output - opening a file, writing text to a file, closing a file, writing numbers to a file, reading text from a file, reading numbers from a file, reading multiple items on one line, appending data, seek() function, binary files, reading binary files, accessing and manipulating files and directories on a disk.

UNIT-5 (Graphical User Interfaces, tkinter, breezypythongui)

The Behavior of Terminal-Based Programs and GUI-Based Programs, Event-Driven
Programming, Coding Simple GUI-Based Programs, Windows and Window Components, Types of Window Components and Their Attributes, Command Buttons and Responding to Events, Input and Output with Entry Fields, Other Useful GUI Resources, Multi-Line Text Areas, Obtaining Input with Prompter Boxes, Check Buttons.

**Textbooks:**

**Reference books:**

**COURSE OUTCOMES**
1. **KO#1**: Have the ability to describe basic programming constructs - operators, conditional and looping constructs with reusable mechanisms.
2. **KO#2**: Have the ability to describe the Strings, lists, tuples and dictionaries.
3. **KO#3**: Have the ability to do the file operations and GUI programming.
4. **UO#1**: Have the ability to draw inferences using in-built functions, loops, decision making and functions.
5. **UO#2**: Have the ability to give examples on strings, lists, tuples and dictionary.
6. **UO#3**: Have the ability to give examples with basic File operations and GUI programming constructs using ‘Python’.
7. **AO#1**: Have the ability to apply the python programming concepts to solve a problem in the relevant domain.

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BROAD OBJECTIVE

Make students understand the thought process, reasoning and holistic life style of Yogic system.

Course Objectives:

☐ To impart basic principles of thought process, reasoning and inference. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.

☐ To impart holistic lifestyle of Yogic-science and wisdom capsules in Sanskrit literature which is very important in modern society experiencing rapid technological advancements and societal disruptions.

☐ To focus on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

Course Content

☐ Basic Structure of Indian Knowledge System

   i) Ashtadasa vidya
   ii) Veda
   iii) Upavedha
   iv) Ayurvedha
   v) Dhanurvedha
   vi) Ghaandravedha
   vii) Vedang
       a. Shiksha,Kalp
       b. Nirutha
       c. Vyakaran
       d. Jyotishya)
   viii) Shastra
       a. Meemamsha
       b. Purana
       c. Tarka Shasthra

☐ Modern Science and Indian Knowledge System

☐ Yoga and Holistic Health care

☐ Case Studies.
Suggested Text/Reference Books

2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amaku,am
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
9. P R Sharma (English translation), Shodashang Hridayam

COURSE OUTCOMES
CO-1: The students will be able to comprehend the concepts of Indian Traditional Knowledge.
CO-2: The students will be able to develop critical thinking skills.
CO-3: The students will be able to connect the past with the present advancements in modern scientific perspective.
CO-4: The students will be able to come to terms with the holistic health care system.
CO-5: The students will be able to develop critical thinking skills.
CO-6: The students will be able to comprehend the principles enshrined in ancient Sanskrit Literature

CO/PO Mapping

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Course designed by: DEPARTMENT OF ENGLISH & HUMANITIES

Approval
Approved by: Meeting of Board of Studies held on 23.06.2019