

**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
(Autonomous)

Kandlakoya, Hyderabad – 501 401

**ACADEMIC REGULATIONS R 18**

**FOR CBCS & OUTCOME BASED B.TECH. REGULAR PROGRAMMES**

(Effective for the students admitted into I year from the  
Academic Year 2018-19 onwards)

**1.0 Under-Graduate Degree Programme in Engineering & Technology**

CMR College of Engineering & Technology, Hyderabad offers 4 Years (8 Semesters) Bachelor of Technology (B.Tech.) degree Programme, under Choice Based Credit System (CBCS), with effect from the Academic Year 2018 - 19 and onwards, in the following Branches of Engineering.

S.No.	Branch
I.	Civil Engineering
II.	Electrical & Electronics Engineering
III.	Mechanical Engineering
IV.	Electronics & Communication Engineering
V.	Computer Science & Engineering
VI.	Information Technology
VII.	CSE- AI & ML
VIII.	CSE- Cybersecurity

**2.0 Admission Procedure**

- 2.1. Admissions will be done as per the norms prescribed by the Government of Telangana. The Government orders in vogue shall prevail.
- 2.2. The candidate should have passed the qualifying examination Intermediate or equivalent on the date of admission.
- 2.3. Seats in each program in the college are classified into Category–A (70% of intake) and Category-B (30% of intake) besides Lateral Entry. Category-A seats will be filled by the Convener, TS-EAMCET Admissions. Category-B seats will be filled by the College as

per the guidelines of the Competent Authority.

- 2.4. Lateral Entry seats for 20% of the candidates from the approved strength of the course shall be admitted into the III Semester directly based on the rank secured by the candidate in TSECET in accordance with the guidelines from the Competent Authority.
- 2.5 The medium of instruction for the entire UG Degree Course in Engineering & Technology (E&T) shall be ENGLISH only.
- 3.0 B.Tech. Degree Course Structure
- 3.1 The B.Tech. Programmes of CMR College of Engineering & Technology are of semester pattern, with 8 Semesters constituting 4 Academic Years, each Academic Year having two Semesters (First/Odd and Second/Even). Each Semester shall have a minimum of 90 Instructional Days.
- 3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below. The Course Structure is organized based on the AICTE Model Curriculum for Under-Graduate Degree Courses in Engineering & Technology (Jan. 2018).
- 3.2.1 Semester Scheme:
- Each UG Programme is of 4 Academic Years (8 Semesters), with the year being divided into two Semesters of minimum 90 Instructional days/Semester and in addition each Semester having - ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Curriculum/ Course Structure as suggested by AICTE are followed.
- 3.2.2 Course Credits:
- The Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practicals Periods: Credits) Structure, based on the following general pattern.
- One Credit - for One hour/ Week/ Semester for Theory/ Lecture (L)/Tutorial Courses; and,
  - One Credit - for Two hours/ Week/ Semester for Laboratory/ Practical (P) Courses

Other student activities like NCC, NSS, NSO, Induction Program, Study Tour, Guest Lecture etc., and other Courses identified as Mandatory Courses (MC) shall not carry Credits.

### 3.2.3 Course Classification:

All Courses offered for the UG Programme are broadly classified as:

- (a) Foundation Courses (Fn C)
- (b) Core Courses (Co C)
- (c) Elective Courses (El C)

- **Foundation Courses** (Fn C) are further categorized as:

- i. HSMC (Humanities, Social Sciences and Management Courses)
- ii. BSC (Basic Science Courses)
- iii. ESC (Engineering Science Courses)

- **Core Courses** (Co C) and Elective Courses (El C) are categorized as PS (Professional Subjects), which are further subdivided as –

- i. PCC (Professional Core Courses)
- ii. PEC (Professional Elective Courses)
- iii. OEC (Open Elective Courses)
- iv. PROJ (Project)

- **Minor Courses** (1 or 2 Credit Courses, belonging to HSMC/ BSC/ ESC/ PCC as per relevance); and

- **Mandatory Courses** (MC - Non-credit oriented).

### 3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course-Structure Grouping for each of the UG PROGRAMME E&T (B.Tech. Degree Programmes), is as listed below:

<i>S. No.</i>	<i>Broad Course Classification</i>	<i>Course Group/ Category</i>	<i>Course Description</i>	<i>Suggested Breakup of Credits by AICTE(16 0)</i>
1		<b>BSC – Basic Science</b>	Includes - Mathematics,	<b>25*</b>

	<b>Foundation Courses (Fn C)</b>	<b>Courses</b>	Physics and Chemistry Subjects	
2		<b>ESC - Engineering Science Courses</b>	Includes fundamental engineering subjects	<b>24*</b>
3		<b>HSMC – Humanities and Social Sciences including Management Courses</b>	Includes subjects related to Humanities, Social Sciences and Management	<b>12*</b>
4	<b>Core Courses (Co C)</b>	<b>PCC– Professional Core Courses</b>	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	<b>48*</b>
5	<b>Elective Courses (El C)</b>	<b>PEC – Professional Elective Courses</b>	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engg.	<b>18*</b>
6		<b>OEC – Open Elective Courses</b>	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	<b>18*</b>
7	<b>Core Courses</b>	<b>Project</b>	B.Tech. Project or UG Project or UG Major Project	<b>15*</b>
8		<b>Industrial Training/</b>	Industrial Training/ Internship/ UG	

		<b>Mini- Project</b>	Mini-Project/ Mini-Project	
9		<b>Seminar</b>	Seminar/ Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engg.	
10		<b>Mandatory Courses (MC)</b>	Mandatory Courses (non-credit)	<b>Nil</b>
<b>Total Credits for B. Tech. Programme</b>				<b>160</b>

\* Minor variation is allowed as per need of the respective disciplines.

#### 4.0 Course Work

- 4.1** A student, after securing admission, shall pursue the B.Tech. UG Programme in a minimum period of 4 Academic Years, and a maximum period of 8 Academic Years (starting from the Date of Commencement of I Year).
- 4.2** As suggested by AICTE, 'Mandatory Induction Programme' shall be offered for all the Branches of Engineering at the start of the I Year UG Degree Course, to enable the newly admitted students get acquainted with the new professional environment, to develop awareness and understanding of the engineering education requirements, and to get them prepared for the academic schedules ahead. The features, activities and pattern of the Induction Programme shall be as per the guidelines suggested in the AICTE Model Curriculum.
- 4.3** Each student shall Register for and Secure 160 Credits for the completion of the UG Programme and the Award of the B.Tech. degree in the respective branch of Engineering.

#### 5.0 Course Registration

- 5.1** A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him about the UG Programme, its Course Structure and Curriculum, Choice/Option for Subjects/ Courses for the purpose of registration, based on his competence, progress, pre-requisites and interest.

- 5.2** The Academic Section of the College invites 'Registration Forms' from students apriorie (before the beginning of the Semester), through 'on-line submissions', ensuring 'DATE and TIME Stamping'. The On-line Registration Requests for any 'Current Semester' shall be completed before the commencement of SEEs (Semester End Examinations) of the 'Preceding Semester'.
- 5.3** Students are advised to individually register for all the number of credits indicated in that semester workload of the respective UG Degree Course Structure - this is termed as the 'Semester Work Load' (SWL).
- 5.4** A student can apply for ONLINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his assigned Faculty Advisor, which should be submitted to the College Academic/Examination Section through the Head of the Department (a copy of the same is to be retained by the Head of the Department, Faculty Advisor and the student).
- 5.5** A student may be permitted to register for the courses in a semester of his choice subject to para 5.4 with the typical work load suggested in the course structure of that semester. A student may register for courses over and above the courses listed in the course structure of the semester with possible additional courses of his choice, limited to a maximum of 3 Credits, based on his PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses in the Department Course Structure and Syllabus contents.
- 5.6** The choice for the 'additional' Courses above the typicalSWL must be indicated clearly, which needs the specific approval and signature of the Faculty Advisor/ Counselor and the HoD on the hard-copy.
- 5.7** If the Student submits ambiguous choices or multiple options or erroneous entries - during On-Line Registration for the Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration, as applicable.
- 5.8** The Course Options exercised through 'ON-LINE' Registration are final and CANNOT be changed; further, alternate choices will also not be considered. However, if the Course that has already been listed for Registration (by the Head of Department) in a Semester and could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Course (subject to offering of such a

Course), or for another existing Course (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

**5.9** Dropping of the Courses may be permitted ONLY AFTER obtaining the prior approval from the Faculty Advisor assigned and the Head of the department (subject to the retaining of the SWL), 'within 15 Days of Time' from the beginning of the current semester.

**5.10** For Mandatory Courses like NCC/ NSS/ NSO etc., a 'Satisfactory Participation Certificate' from the concerned authorities for the relevant Semester is essential. No Marks or Grades or Credits shall be awarded for these activities.

### **6.0 Courses to be offered**

**6.1** A typical Section (or Class) Strength for each Semester shall be 60.

**6.2** An Elective course may be offered to the Students, ONLY IF a Minimum of 20 Students ( $1/3$  of the Section Strength) opt for the same. The Maximum Strength of a Section is limited to 80 ( $60 + 1/3$  of the Section Strength).

**6.3** More than one teacher may offer the same Course (Laboratory/ Practicals may be included with the corresponding Theory Course in the same Semester) in any Semester. However, selection choice for students will be based on - 'first come first serve Basis and CGPA Criterion' (i.e., the first focus shall be on early on-line entry from the student for Registration in that Semester, and the second focus, if needed, will be on CGPA of the student). The decision of the Head of the department in this regard is final.

**6.4** If more entries for Registration of a course come into picture, the Head of the Department shall decide on offering of such a Course.

### **7.0 Attendance Requirements**

**7.1** A student shall be eligible to appear for the End Semester Examinations, if he acquires a minimum of 75% of attendance in aggregate of all the Courses (excluding Mandatory or Non-Credit Courses) for that Semester.

- 7.2** Condoning 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 on genuine and valid medical grounds, based on the student's representation with supporting evidence. Provision of such condonation is however limited to a maximum of 3 times during the maximum permissible UG study period.
- 7.3** A stipulated fee shall be payable towards condoning of shortage of attendance.
- 7.4** Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- 7.5** Students, whose shortage of attendance is not condoned in any Semester, are not eligible to appear for End Examinations of that Semester. Such students are detained and their registration for that Semester shall stand cancelled. They will not be promoted to the next Semester. They may seek re-registration for all those Courses registered in that Semester in which they got detained, by seeking re-admission for that Semester as and when offered; in case if there are any Professional Electives and/or Open Electives, the same may also be re-registered if offered, however, if those Electives are not offered in later Semesters, then alternate Electives may be chosen from the SAME set of Elective Courses offered under that category.

**8.0 Academic Requirements**

The following Academic Requirements have to be satisfied, in addition to the Attendance Requirements mentioned in Item No.7.

- 8.1** A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 35% marks (25 out of 70 marks) in the End Semester Examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing 'P' Grade or above in that Subject/ Course.
- 8.2** A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to Technical Seminars, if he secures not less than 40% of the total marks to be awarded. The student would be treated as failed, if he -
- (i) does not present the technical Seminars as required in the VI and VIII Semesters, or
  - (ii) Secures less than 40% of marks in Technical Seminar Evaluations.



He may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent Semester, as and when it is scheduled.

- 8.3** A Student will not be promoted from I Year to II Year, unless he fulfils the Attendance and Academic Requirements and secures a minimum of total 19 Credits of I Year, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.
- 8.4** A Student will not be promoted from II Year to III Year, unless he fulfils the Attendance and Academic Requirements and secures a minimum of total 47 Credits up to IV Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.
- 8.5** A Student will not be promoted from III Year to IV Year, unless he fulfils the Attendance and Academic Requirements and secures a minimum of total 72 Credits up to VI Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.
- 8.6A** Student shall - register for all courses covering 160 credits as specified and listed (with the relevant Course Classifications as mentioned) in the course structure, put up all the Attendance and Academic requirements for 160 credits securing a minimum of 'P' Grade (Pass Grade) or above in each Course, and 'earn All 160 credits securing SGPA  $\geq 5.0$  (in each Semester), and CGPA (at the end of each successive Semester)  $\geq 5.0$ , to successfully complete the UG Programme.
- 8.7** If a student registers for any 'additional courses' (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totaling to 160 Credits as specified in the Course Structure of his Department, the performances in those 'additional Courses' (although evaluated and graded) shall not be taken into account while calculating the SGPA and CGPA. For such 'additional Courses' registered, the % of marks and the Letter Grade alone shall be indicated in the Grade Card as a performance measure subject to the completion of the Attendance and Academic Requirements as stated under Clauses 7.0 and 8.1 – 8.7.
- 8.8** Students who fail to earn 160 credits as per the course structure, and as indicated above, within 8 Academic Years from the Date of Commencement of their I

Year shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

- 8.9** When a Student is detained due to shortage of attendance in any Semester, he may re-register for that Semester, as and when offered, with the Academic Regulations of the Batch into which he re-registers. However, no Grade Allotments or SGPA/CGPA calculations will be done for that entire Semester in which he got detained.
- 8.10** When a Student is detained due to lack of Credits in any year, he may re-register for the next year, after fulfilment of the Academic Requirements, with the Academic Regulations of the Batch into which he re-registers.
- 8.11** A student who is eligible to appear in the End Semester Examination in any Course, but was absent for it or failed (thereby failing to secure P Grade or above), may reappear for that Course at the supplementary examination as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that Course will be carried over, and added to the Marks to be obtained in the supplementary examination, for evaluating his performance in that Course.

**9.0 Evaluation - Distribution and Weightage of Marks**

- 9.1** The performance of a student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory or Practicals or Seminar or Drawing/Design or Minor Course or Major Project Phase-I or Major Project Phase-II. These evaluations shall be based on CIE (Continuous Internal Evaluation) and SEE (Semester End Examination), and a Letter Grade corresponding to the % marks obtained shall be given.
- 9.2** For Theory subjects 30 marks are allocated for Continuous Internal Evaluation. Continuous Internal Evaluation during a semester is based on two internal examinations conducted during the semester. 70 marks are allocated for the Semester End Examination SEE.
- (a) Each internal examination consists of two parts, part-A consisting of 5 short answer questions carrying two marks each, Part-B consisting of 3 essay type questions carrying 5 marks each with a total duration of 1 hour 40 minutes. The essay paper shall contain one question from each unit with internal choice. While the first internal examination shall be conducted from 1 to 2.5 units of

the syllabus, the second internal examination shall be conducted on 2.5 to 5 units. Five (05) marks are allocated for Assignment (as specified by the subject teacher concerned). There will be two assignments in the semester for each course consisting of 5 marks each. The first Assignment should be submitted before the conduct of the first internal examination and second Assignment should be submitted before the conduct of the second internal examination.

- (b) The total marks secured by the student in each internal examination are evaluated for 30 marks. The final marks secured in internal evaluation by each candidate are arrived at by giving a weightage of 70% to the best secured internal examination and 30% weightage to the least secured internal examination. A student who is absent from any assignment/ internal examination for any reason what so ever shall be deemed to have secured 'zero' marks in the test/ examination and no makeup test/ examination shall be conducted.

**9.3** For Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 40 internal marks, and 60 marks are assigned for Laboratory/Practical End Semester Examination (SEE). Out of the 40 marks for internals, day-to-day work in the laboratory shall be evaluated for 30 marks; and for the remaining 10 marks - internal practical test shall be conducted by the concerned laboratory teacher. For Practical Subjects, the end semester examination SEE shall be conducted with an external examiner and the laboratory teacher. The external examiner from other institutions or industry shall be appointed by the Controller of Examinations.

**9.4** For the subjects having design and / or drawing, (such as Engineering Graphics, AutoCAD, Engineering Drawing, Machine Drawing and Estimation etc.,) the internal evaluation carries 40 marks (the distribution is 20 marks for day-to-day work and 20 marks for internal examination) and 60 marks shall be for end semester examination. There shall be two internal examinations in a semester. The final marks secured by each candidate in the internal evaluation is arrived at by giving a weightage of 70% to the best secured internal examination and 30% weightage to the least secured internal examination.

**9.5 Open Electives (OE):** Students have to choose four Open Electives during the programme by meeting pre-requisite of the course if any. However, students cannot opt

for open elective course if it is already studied by the student as part of Professional Elective or any other category. The Courses offered under Open Electives in an academic year will be reviewed and finalized by the College Academic Committee before the commencement of the academic year.

- 9.6** There shall be a Mini-Project-I/ Internship-I, to be taken up in the college or industry during the summer vacation after IV Semester examination. The Mini-Project-I/ Internship-I shall be evaluated during the V Semester. The Mini-Project-I/Internship-I shall be submitted in a report form and should be presented before a committee, which shall be evaluated for Satisfactory or Non-satisfactory. The committee consists of Head of the Department, the supervisor of Mini-Project-I/Internship-I, a senior faculty member of the department.
- 9.7** There shall be a Mini-Project-II/ Internship-II, to be taken up in the college or industry during the summer vacation after VI Semester examination. The Mini-Project-II/ Internship-II shall be evaluated during the VII Semester. The Mini-Project-II/ Internship-II shall be submitted in a report form and should be presented before a committee, which shall be evaluated for Satisfactory or Non-satisfactory. The committee consists of Head of the Department, the supervisor of mini project, a senior faculty member of the department.
- 9.8** There shall be a Technical Seminar-I presentation in VI Semester. For the Technical Seminar-I, the student shall collect the information on a specialized topic related to his branch other than Mini projects-I & II/ Internships-I & II/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar-I supervisor and a senior faculty member from the department. The Technical seminar will be evaluated for 100 marks. There shall be no SEE or external examination for the Technical Seminar-I.
- 9.9** There shall be a Technical Seminar-II presentation in VIII Semester. For the Technical

Seminar-II, the student shall collect the information on a specialized topic related to his branch other than the Mini projects-I & II/ Internships-I & II/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar-II supervisor and a senior faculty member from the department. The Technical Seminar-II will be evaluated for 100 marks. There shall be no SEE or external examination for the Technical Seminar-II.

**9.10** Each student shall start the Project Work during the VII Semester as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of the Department.

**a)** The Project Work shall be divided and carried out in 2 phases : Phase – I (Project-I) during VII Semester, and Phase – II (Project-II) during VIII Semester, and the student has to prepare two independent Project Work Reports – *one each during each phase*. First Report shall include the Project Work carried out under Phase – I, and the Second Report (Final Report) shall include the Project Work carried out under Phase – I and Phase – II put together. Phase – I and Phase – II of the Project Work shall be evaluated for 100 marks each.

**b)** Out of the total 100 marks allotted for each Phase of the Project Work, 40 marks shall be for the Continuous Internal Evaluation (CIE), and 60 marks shall be for the End Semester Viva-voce Examination (SEE). The marks earned under CIE for both Phases of the Project shall be awarded by the Project Guide/Supervisor (based on the continuous evaluation of student's performance during the two Project Work Phases/periods); and the marks earned under SEE shall be awarded by the Project Viva-voce Committee/ Board (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

**c)** For the Project Phase - I, the Viva-voce shall be conducted at the end of the VII Semester, before the commencement of the semester End Examinations, at the Department Level by a Committee comprising of the HoD or One Professor and Supervisor (no external examiner), and the Project Phase – II Viva-voce (or Final Project Viva-voce) shall be conducted by a Committee comprising of an External Examiner, the Head of the Department and the Project Supervisor at

the end of the VIII Semester, before the commencement of the semester End Examinations. The External Examiner shall be nominated by the CoE from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

**d)** If a student does not appear for any of the two Viva-Voce examinations at the scheduled times as specified above, he may be permitted to reappear for Project Phase-I and/or Project Phase-II Viva-voce examinations, as and when they are scheduled in that semester; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester(s), as and when they are scheduled, as supplementary candidate. For the registration of Project Phase-II the student must have passed Project Phase-I.

**9.11** For NSS/ NSO Mandatory Courses and/or any other Mandatory Non-Credit Course offered in a semester, a 'Satisfactory Participation Certificate' shall be issued to the student from the authorities concerned, only after meeting the minimum attendance requirements in the Course. No Marks or Letter Grade shall be allotted for the Mandatory Courses.

## **10.0. Semester End Examination (SEE)**

### **10.1. Theory Courses**

The end semester examination will be conducted for 70 marks which consist of Part-A and Part-B. The examination is for 3 hours duration. Question paper pattern is as follows.

#### **Part-A: 20 Marks**

There shall be 10 questions each carrying 2 Marks. (Two questions from each Unit)

#### **Part-B: 50 Marks**

There shall be 10 questions out of which 5 questions (Internal choice within a unit i.e. two questions from each unit out of which one question to be answered) are to be answered, each question carry 10 marks.

### **10.2. Laboratory Courses**

Each laboratory course is evaluated for 60 marks. The examination shall be conducted by the laboratory teacher and one external examiner appointed by the Controller of Examinations from other institutions or industry in consultation with the Head of the

Department.

### 10.3. Supplementary Examinations

The schedule for supplementary examinations shall be as notified by the institute from time to time.

- 10.4.** For NCC/ NSS/ NSO types of Courses, and/or any other Mandatory Non-Credit Course offered in a Semester, a 'Satisfactory Participation Certificate' shall be issued to the Student from the concerned authorities, only after meeting minimum attendance requirements in the Course. No marks or Letter Grade shall be allotted for these activities and it will not be part of calculation of CGPA.

### 11.0. Grading Procedure

- 11.1.** Marks will be awarded to indicate the performance of each student in each Theory Course, or Laboratory Course, or Technical Seminar, or Project etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination). As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed ...

11.2	<i>% of Marks Secured (Class Intervals)</i>	<i>Letter Grade (UGC Guidelines)</i>	<i>Grade Points</i>
	100% or below but not less than 85% ( $\geq 85\%$ , $\leq 100\%$ )	<b>O</b> (Excellent)	<b>10</b>
	Below 85% but not less than 70% ( $\geq 70\%$ , $< 85\%$ )	<b>A</b> (Very Good)	<b>9</b>
	Below 70% but not less than 60% ( $\geq 60\%$ , $< 70\%$ )	<b>B</b> (Good)	<b>8</b>
	Below 60% but not less than 55% ( $\geq 55\%$ , $< 60\%$ )	<b>C</b> (above Average)	<b>7</b>
	Below 55% but not less than 50% ( $\geq 50\%$ , $< 55\%$ )	<b>D</b> (Average)	<b>6</b>
	Below 50% but not less than 40% ( $\geq 40\%$ , $< 50\%$ )	<b>P</b> (Pass)	<b>5</b>
	Below 40% ( $< 40\%$ )	<b>F</b> (FAIL)	<b>0</b>

A student obtaining F Grade in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

11.3. A Letter Grade does not imply any specific % of Marks.

11.4. In general, a student shall not be permitted to repeat any Course(s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'. However, he has to repeat all the Courses pertaining to that Semester, when he is detained (as listed in Items 8.10- 8.11).

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

**Credit Points (CP) = Grade Point (GP) x Credits .... For a Course**

11.6. The Student passes the Course only when he gets  $GP \geq 5$  (P Grade or above).

11.7. The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points ( $\Sigma CP$ ) secured from ALL Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$\text{SGPA} = \{ \sum_{i=1}^N C_i G_i \} / \{ \sum_{i=1}^N C_i \} \dots \text{For each Semester,}$$

where 'i' is the Course indicator index (takes into account all Courses in a Semester), 'N' is the no. of Courses 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department),  $C_i$  is the no. of Credits allotted to the  $i^{\text{th}}$  Course, and  $G_i$  represents the Grade Points (GP) corresponding to the Letter Grade awarded for that  $i^{\text{th}}$  Course.

11.8. The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$\text{CGPA} = \{ \sum_{j=1}^M C_j G_j \} / \{ \sum_{j=1}^M C_j \} \dots \text{for all S Semesters registered (ie., upto and inclusive of S Semesters, } S \geq 2 \text{),}$$



Where 'M' is the Total no. of Courses (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1<sup>st</sup> Semester onwards up to and inclusive of the Semester S (obviously  $M > N$ ), 'j' is the Course indicator index (takes into account all Courses from 1 to S Semesters),  $C_j$  is the no. of Credits allotted to the j<sup>th</sup> Course, and  $G_j$  represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j<sup>th</sup> Course. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

**11.9.** For Merit Ranking or Comparison Purposes or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs will be used.

**11.10.** For Calculations listed in Item 11.5– 11.8, performance in failed Courses (securing F Grade) will also be taken into account, and the Credits of such Courses will also be included in the multiplications and summations. However, Non-Courses will not be taken into consideration.

**12.0. Passing Standards:**

**12.1.** A student shall be declared successful or 'passed' in a Semester, only when he gets a  $SGPA \geq 5.00$  (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UG PROGRAMME, only when he gets a  $CGPA \geq 5.00$ ; subject to the condition that he secures a  $GP \geq 5$  (P Grade or above) in every registered Course in each Semester (during the entire UG PROGRAMME) for the Degree Award, as required.

**12.2.** A Student shall be declared successful or 'passed' in any Non-Credit Course, if he secures a 'Satisfactory Participation Certificate' for that Mandatory Course.

**12.3.** After the completion of each Semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the Registered Students of that Semester, indicating the Letter Grades and Credits earned. It will show the details of the Courses Registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA.

**13.0. Declaration of Results**

**13.1** Computation of SGPA and CGPA are done using the procedure listed in 11.5 – 11.9.

**13.2.** For Final % of Marks equivalent to the computed final CGPA, the following formula may be used ...

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

**14.0. Award of Degree**

- 14.1 A Student who registers for all the specified Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire UG E&T Programme (UG PROGRAMME), and secures the required number of 160 Credits (with CGPA  $\geq 5.0$ ), within 8 Academic Years from the Date of Commencement of the First Academic Year, shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.
- 14.2. A Student who qualifies for the Award of the Degree as listed in Item 14.1, shall be placed in the following Classes ...
- (a) Students with final CGPA (at the end of the UG PROGRAMME)  $\geq 8.00$ , and fulfilling the following conditions -
- (i) should have passed all the Courses in 'FIRST APPEARANCE' within the first 4 Academic Years (or 8 Sequential Semesters) from the Date of Commencement of his First Academic Year,
  - (ii) should have secured a CGPA  $\geq 8.00$ , at the end of each of the 8 Sequential Semesters, starting from the I Year I Semester onwards,
  - (iii) should not have been detained or prevented from writing the End Semester Examinations in any Semester due to shortage of attendance or any other reason, shall be placed in '**FIRST CLASS with DISTINCTION**'.
- (b) Students having final CGPA (at the end of UG PROGRAMME)  $\geq 8.00$ , but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.
- (c) Students with final CGPA (at the end of the UG PROGRAMME)  $\geq 6.50$  but  $< 8.00$ , shall be placed in 'FIRST CLASS'.
- (d) Students with final CGPA (at the end of the UG PROGRAMME)  $\geq 5.50$  but  $< 6.50$ , shall be placed in 'SECOND CLASS'.
- (e) All other Students who qualify for the Award of the Degree (as per Item 14.1), with final CGPA (at the end of the UG PROGRAMME)  $\geq 5.00$  but  $< 5.50$ , shall be placed in 'PASS CLASS'.
- 14.3. A student with final CGPA (at the end of the UG PROGRAMME)  $< 5.00$  will not be eligible for the Award of the Degree.

14.4. Students fulfilling the conditions listed under Item 14.2(a) alone will be eligible candidates for - 'College Rank' and 'Gold Medal' considerations.

#### **15.0. Withholding of Results**

15.1 If the student has not paid fees to College at any stage, or has pending dues against his name due to any reason whatsoever, or if any case of indiscipline is pending against him, the result of the student may be withheld, and he will not be allowed to go into the next higher Semester. The Award or issue of the Degree may also be withheld in such cases.

#### **16.0 Transitory Regulations**

##### **16.1 For Students detained due to shortage of attendance and credits**

- i) The Student who has not registered in a particular semester for any reason, or has been detained for want of attendance may be considered eligible for readmission to the same semester in the next Academic Year or subsequent academic years. The student who has been detained for lack of credits can be readmitted to the next Academic Year only on obtaining minimum required credits.
- ii) A Student who has been detained in I year I Semester of R14/R15 Regulations due to lack of attendance shall be permitted to join I year I Semester of R18 Regulations and is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.
- iii) A student who has been detained in II semester of I Year or any semester of II, III and IV years of R14/R15 regulations for want of attendance shall be permitted to join the corresponding semester of R18 regulations and is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in I Year. The R18 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.
- iv) A student of R14/R15 Regulations who has been detained due to lack of credits shall be promoted to the next Academic Year of R18 Regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission.
- v) After re-admission the student is required to study the course as prescribed in the new regulations for the re-admitted programme at that level and thereafter.

- vi) A student who has failed in any course(s) under any regulation has to pass those course(s) in the same regulations.
- vii) In case the course(s) offered in subsequent semesters are repetitive, substitute courses identified by the BOS for replacement of completed courses by the students will be given. The students will be suggested to register the said substitute course(s) in the new regulation. One Internal examination for the substitute course(s) may be conducted before commencement of end semester examinations.
- viii) The marks/credits/SGPA are transferred and converted (as per applicable regulations) for all subjects of old regulation if necessary and treated as successfully cleared in the new prescribed program course structure.
- ix) For readmitted students the courses studied and cleared in earlier Regulation and not offered those courses in new applicable Regulation are not considered for SGPA & CGPA calculation when secured credits are greater than maximum credits for the award of degree.
- x) The decision of BOS is final in case of any ambiguity in identifying the equivalent/substitute courses
- xi) The decision of Academic council is final in case of any ambiguity in transitory regulations

#### **16.2. For Transferred Students**

- i) The students seeking transfer to CMRCET from various other Universities/Institutions have to pass the failed course(s) which are equivalent to the course(s) of CMRCET, and also have to pass the course(s) of CMRCET which the students have not studied at the earlier institution. Further the students have passed some of the course(s) at the earlier institutions, and if the same course(s) are prescribed in different semesters of CMRCET and repeated, then substitute courses(with equal credits) identified by BOS may be given to the students
- ii) For not cleared course(s) in the previous Institute, equivalent course(s) will be identified by the BOS for pursuing the same. The students will be suggested to pursue the course and to register the said equivalent course(s) in the new regulation and to qualify in examinations.
- iii) Marks/Grades/Credits obtained in the courses completed in previous Institution are to be converted in to equivalent Grades/Credits/SGPA/CGPA as per CMRCET regulations.

- iv) One Internal examination for the course(s) not studied in previous institution and taken as additional/substitute courses in CMRCET may be conducted before commencement of end semester examinations.
- v) If necessary the student may be given additional course(s) in place of the course(s) studied in earlier Institution which are not part of CMRCET regulation to balance and meet the credit requirement for the award of degree as per applicable regulation
- vi) The students who seek transfer to CMRCET from various other Universities/Institutions, and satisfy credits requirement as per earlier institution but not satisfy the credit requirements as per CMRCET after finalizing equivalent course(s), may be permitted to continue the programme. However such a student has to meet the requirement of credits for promotion to the next year as per CMRCET applicable regulations.
- vii) For transferred students the courses studied and cleared in earlier Institution and not offered those courses in CMRCET are not considered for SGPA & CGPA calculation when secured credits are greater than maximum credits for the award of degree.
- viii) In case of any ambiguity in identifying the equivalent/substitute courses, the decision of BOS is final.
- ix) The decision of Academic council is final in case of any ambiguity in transitory regulations

## **17.0 Student Transfers**

**17.1** There shall be no Branch transfers after the completion of Admission Process.

**17.2** Transfer of candidates from other Institutions will be governed by the regulations of Telangana State Government issued from time to time.

## **18.0 Scope**

- i) Where the words “he”, “him”, “his”, occur in the write-up of regulations, they include “she”, “her”, “hers”.
- ii) Where the words “Subject” or “Subjects”, occur in these regulations, they also imply “Course” or “Courses”.
- iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.

- iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor/ Principal is final.
- v) The College may change or amend the Academic Regulations, Course Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all Students with effect from the dates notified by the College Authorities.

**ACADEMIC REGULATIONS FOR B.TECH. (LATERAL ENTRY SCHEME)**

(Applicable for the students admitted into II year B.Tech. (Lateral Entry Scheme) from the Academic Year 2019-20 and onwards)

**1. Eligibility for award of B. Tech. Degree (LES)**

- 1.1. The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.
- 1.2. The candidate shall register for 122 credits and secure 122 credits from II to IV-year B.Tech. Program (LES) for the award of B.Tech. Degree. They are exempted from the courses of I year offered to regular entry students.
- 1.3. The students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seats.
- 1.4. The attendance regulations of B.Tech. (Regular) shall be applicable to B.Tech. (LES).

**2. Promotion Rule**

A student shall be eligible for promotion in B.Tech programme, if he/she acquires the minimum number of credits as given below:

- 2.1. A student shall be promoted from II Year to III Year only if he/she fulfills the academic requirements of 24 credits out of 41 credits (60% of average credits) up to II-year II Semester, from all the examinations, whether or not the candidate takes the examinations.
- 2.2. A student shall be promoted from III year to IV year only if he/she fulfills the academic requirements of 49 credits out of 83 credits (60% of average credits) up to III Year II Semester from all the examinations, whether or not the candidate takes the examinations.
- 2.3. A student shall register and put up minimum attendance in all 122 credits and earn all 122 credits to be eligible for the award of degree.
- 2.4. Students who fail to earn 122 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission stands cancelled.

### 3. Award of Class

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

#### MALPRACTICE RULES

##### Disciplinary Action for Malpractices/Improper Conduct in Examinations

	<b>Nature of Malpractices/ Improper conduct</b>	<b>Punishment</b>
1.(a)	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)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any 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.	Expulsion from the examination hall and cancellation of the 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.



2.	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.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate Who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the Remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles 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	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	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	Cancellation of the performance in that subject
6.	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 or organizes a walk out or instigates others to examination hallwalk out, or threatens the officer-in-charge or any person on duty in or outside the examination hall of any	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates are also debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is

	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.	registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The

		continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of That semester/year. The candidate is also debarred and forfeits the seat.
9.	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.	If the student belongs to the college, expulsion from the examination performance in that subject and all other subjects shall and cancellation of the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project

		work and shall not be permitted for other remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College Academic Committee for further action to award suitable punishment.	

### **Malpractices identified by squad or special invigilators**

Punishments to the candidates as per the above guidelines.

### **Malpractice identified at Spot center during valuation**

- 1) The following procedure is to be followed in the case of malpractice cases detected during valuation, scrutiny etc. at spot center. Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee will meet and discuss/question the candidate and based on the evidences, the committee will recommend suitable action on the candidate.
- 2) A notice is to be served to the candidate(s) involved through the Principal to his address and to the candidate(s) permanent address regarding the malpractice and seek explanations.
- 3) The involvement of staff who are in charge of conducting examinations, invigilators valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing in correct or misleading information)

that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommended for award of appropriate punishment after thorough enquire.

4) Based on the explanation and recommendation of the committee action may be initiated

**5) Malpractice committee:**

(a) Controller of Examinations	Chairman
(b) Assistant Controller of Evaluation	Member
(c) Chief Examiner of the Course/ Subject Expert	Member
(d) Concerned Head of the Department	Member
(e) Concerned Invigilator	Member

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**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous)

**DEPARTMENT OF CSE (AI&ML)**

**Institute Vision.**

To be a premier academic institution striving continuously for excellence in technical education , research and technological service to the nation.

**Institute Mission.**

- Create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with a concern for the society.
- Pursue and disseminate research findings and offer knowledge based technological services to satisfy the needs of society and the industry.
- Promote professional ethics, leadership qualities and social responsibilities.

**Vision of the Department.**

- To evolve as a centre of academic excellence in Computer Science & Engineering with Artificial Intelligence by building strong teaching and research environment.

**Mission of the Department.**

- To offer high quality graduate programs in computer science & Engineering with Artificial Intelligence education and to prepare students for professional career and/or higher studies globally.
- To develop self learning abilities and professional ethics to serve the society.

**Program Educational Objectives (PEOs)**

**PEO I:** Excel in their professional career and higher education in Computer Science & Engineering and chosen fields.

**PEO II:** Demonstrate leadership qualities, teamwork and professional ethics to serve the society

**PEO III:** Adapt to state of art technology through continuous learning in the areas of interest.

### **Program Outcomes**

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.



10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**

**(Autonomous)**

Kandlakoya, Hyderabad – 501 401

**B. Tech (CSE-AI & M L ) Course Structure-20, Regulation-18**

Semester –I							
Course Code	Category	Ccourse Title	Hours/ Week			Credits C	Total Contact Hours/ Week
			L	T	P		
A30004	BSC	Linear Algebra and Calculus	3	1	0	4	4
A30009	BSC	Applied Physics	3	1	0	4	4
A30501	ESC	Programming for Problem Solving	3	0	0	3	3
A30313	ESC	Engineering Drawing	1	0	3	2.5	4
A30023	BSC	Applied Physics Lab	0	0	3	1.5	3
A30502	ESC	C Programming Lab	0	0	3	1.5	3
A30505	ESC	Basic Internet of Things Lab	0	0	2	1	2
A30020	HSMC	Introduction to Social Innovation	0	0	2	1	2
<b>Total</b>			<b>10</b>	<b>2</b>	<b>13</b>	<b>18.5</b>	<b>25</b>

Semester –II							
Course Code	Category	Course Title	Hours / Week			Credits C	Total Contact Hours/ Week
			L	T	P		
A30005	BSC	Ordinary Differential Equations and Multivariable Calculus	3	1	0	4	4
A30001	HSMC	English	2	0	0	2	2
A30011	BSC	Engineering Chemistry	3	0	0	3	3
A30503	ESC	Data Structures & Algorithms	3	0	0	3	3
A30002	HSMC	English Language Communication Skills Lab	0	0	3	1.5	3
A30012	BSC	Engineering Chemistry Lab	0	0	3	1.5	3
A30504	ESC	Data Structures & Algorithms Lab	0	0	3	1.5	3
A30314	ESC	Engineering Workshop	0	0	3	1.5	3
A30019	BSC	Engineering Exploration &Practice	0	0	3	1.5	3
<b>Total</b>			<b>11</b>	<b>1</b>	<b>15</b>	<b>19.5</b>	<b>27</b>
<b>Total Credits I year: 38</b>							

Semester –III							
Course Code	Category	Course Title	Hours / Week			Credits	Total Contact Hours/ Week
			L	T	P		
A30506	PCC	Discrete Mathematics	3	0	0	3	3
A30007	BSC	Numerical Techniques & Probability Distributions	3	1	0	4	4
A30513	PCC	Computer Organization & Architecture	3	1	0	4	4
A36201	PCC	Object Oriented Programming through Java	3	0	0	3	3
A30228	ESC	Basic Electrical Engineering	3	0	0	3	3
A30229	ESC	Basic Electrical Engineering Lab	0	0	3	1.5	3
A36202	PCC	JAVA Lab	0	0	3	1.5	3
A30021	HSMC	Social Innovation in Practice	0	0	2	1	2
A30015	MC	Soft Skills & Professional Ethics	0	0	2	0	2
<b>Total</b>			<b>15</b>	<b>2</b>	<b>10</b>	<b>21</b>	<b>27</b>

Semester –IV							
Course Code	Category	Course Title	Hours / Week			Credits	Total Contact Hours/ Week
			L	T	P		
A36601	PCC	Machine Learning	3	1	0	4	4
A30511	PCC	Design & Analysis of Algorithms	3	1	0	4	4
A30516	PCC	Operating Systems	3	0	0	3	3
A30509	PCC	Database Management Systems	3	1	0	4	4
A30510	PCC	Database Management Systems Lab	0	0	3	1.5	3
A36602	PCC	Machine Learning Lab	0	0	4	2	4
A30517	PCC	Operating Systems Lab	0	0	3	1.5	3
A30016	MC	Gender Sensitization	0	0	2	0	2
A30022	MC	NCC/NSS	0	0	2	0	2
<b>Total</b>			<b>12</b>	<b>3</b>	<b>14</b>	<b>20</b>	<b>29</b>

## B. Tech CSE (AI&ML) R-18

Total Credits 1st year: 41							
Semester –V							
Course Code	Category	Course Title	Hours/week			Credits	Total Contact Hours/Week
			L	T	P		
A36603	PCC	Artificial Intelligence	3	0	0	3	3
A30525	PCC	Software Engineering	3	0	0	3	3
A30514	PCC	Computer Networks	3	0	0	3	3
A36605	PCC	Theory of Computation	3	0	0	3	3
A36606	PCC	Computer Vision	3	0	0	3	3
PE	PEC	Professional Elective-I	3	0	0	3	3
A36604	PCC	Artificial Intelligence lab	0	0	3	1.5	3
A36607	PCC	Computer Vision lab	0	0	3	1.5	3
A30014	MC	Environmental Sciences	2	0	0	0	2
<b>Total</b>			<b>18</b>	<b>0</b>	<b>6</b>	<b>21</b>	<b>26</b>
A36627	MC	Mini Project-I	During Summer Vacations / Non-Credit				
A36629		Summer Internship-I					

Semester –VI							
Course Code	Category	Course Title	Hours/Week			Credits	Total Contact Hours/Week
			L	T	P		
A36608	PCC	Deep learning	3	0	0	3	3
A36610	PCC	Internet Technologies	3	0	0	3	3
A36611	PCC	Soft and Evolutionary computing	3	0	0	3	3
A36612	PCC	Natural language processing	3	0	0	3	3
PE	PEC	Professional Elective-II	3	0	0	3	3
A36609	PCC	Deep learning Lab	0	0	3	1.5	3
A30003	HSMC	Advanced English Communication Skills Lab	0	0	3	1.5	3
A36631	PROJ	Technical Seminar-I	2	0	0	2	2
A30017	MC	Indian Constitution	2	0	0	0	2
A30018	MC	Essence of Indian Traditional Knowledge					
A30556	MC	Cyber Security	2	0	0	0	2
<b>Total</b>			<b>21</b>	<b>0</b>	<b>6</b>	<b>20</b>	<b>27</b>

<b>Total Credits III Year: 41</b>
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Semester –VII							
Course Code	Category	Course Title	Hours Per Week			Credits	Total Contact Hours/week
			L	T	P		
A30013	HSMC	Business Management & Financial Analysis	4	0	0	4	4
PE	PEC	Professional Elective-III	3	0	0	3	3
	PEC	Professional Elective-IV	3	0	0	3	3
	PEC	Professional Elective-V	3	0	0	3	3
OE	OEC	Open Elective-I	3	0	0	3	3
	OEC	Open Elective-II	3	0	0	3	3
A36633	PROJ	Major Project Phase-I	0	0	6	3	6
<b>Total</b>			<b>19</b>	<b>0</b>	<b>6</b>	<b>22</b>	<b>25</b>
A36628	MC	Mini Project-II	During Summer Vacations / Non-Credit				
A36630		Summer Internship-II					

Semester –VIII							
Course Code	Category	Course Title	Hours / Week			Credits	Total Contact Hours /week
			L	T	P		
PE	PEC	Professional Elective-VI	3	0	0	3	3
OE	OEC	Open Elective-III	3	0	0	3	3
	OEC	Open Elective-IV	3	0	0	3	3
A36632	PROJ	Technical Seminar-II	2	0	0	2	2
A36634	PROJ	Major Project Phase- II	0	0	14	7	14
<b>Total</b>			<b>11</b>	<b>0</b>	<b>14</b>	<b>18</b>	<b>25</b>
<b>Total Credits IV Year: 40</b>							

Professional Electives			
Sl.No	Subject Code	Name of the Subject	Category
12	A30528	Data Warehousing and Data Mining	PEC-I
13	A36613	Advanced Python Programming	
14	A36614	Network Security	
15	A30542	Cloud Computing	PEC-II
16	A36615	High Performance Computing	
17	A30537	Data Analytics with R	
18	A36616	Intelligent Information Retrieval	PEC-III
19	A36617	Artificial Intelligence for Cybersecurity	
20	A36618	Robotics Process Automation	
21	A36619	Big Data Analytics and Business Intelligence	PEC-IV
22	A36620	Time Series Analysis	
23	A36621	Speech and Language Processing	
24	A36622	Augmented Reality and Virtual Reality	PEC-V
25	A30539	Ethical Hacking	
26	A36623	Reinforcement Learning	
27	A36624	Artificial Intelligence in Healthcare	PEC-VI
28	A36625	Artificial Intelligence in Gaming	
29	A36626	Artificial Intelligence in Block Chain	

**Composition Table**

Semester	BS	ES	HS&M	PC	PE	OE	Project	Total Credits
I	9.5	8	1					<b>18.5</b>
II	10	6	3.5					<b>19.5</b>
III	4	4.5	1	12.5				<b>22</b>
IV				19				<b>19</b>
V				18	3			<b>21</b>
VI			1.5	13.5	3		2	<b>20</b>
VII			4		9	6	3	<b>22</b>
VIII					3	6	9	<b>18</b>
<b>Total</b>	<b>23.5</b>	<b>18.5</b>	<b>11</b>	<b>63</b>	<b>18</b>	<b>12</b>	<b>14</b>	<b>160</b>
<b>%C</b>	<b>15%</b>	<b>12%</b>	<b>7%</b>	<b>39%</b>	<b>11%</b>	<b>85</b>	<b>95</b>	
<b>AICTE Credits</b>	<b>25</b>	<b>24</b>	<b>12</b>	<b>48</b>	<b>18</b>	<b>18</b>	<b>15</b>	

**BS: Basic Sciences****ES: Engineering Sciences****HS&M: Humanities, Sciences & Management****PC: Professional Core****PE: Professional Elective****OE: Open Elective**

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**Open Electives**

Sl.No	Subject Code	Name of the Subject
1	A30554	Java Programming
2	A30531	Python Programming
3	A30555	Introduction to Database Management Systems
4	A30537	Data Analytics with R
5	A30557	Web Programming
6	A30542	Cloud Computing
7	A30538	Deep Learning
8	A30559	Introduction to Data Science
9	A30471	Principles of Electronic Communications
10	A30472	Basic Electronics Engineering
11	A30383	Fundamentals of Engineering Materials
12	A30377	Basics of Thermodynamics
13	A30258	Basics of Power Electronics & Drives
14	A30252	Power Generation Systems
15	A30160	Disaster Management and Mitigation
16	A30161	Remote Sensing and GIS
17	C30161	Logistics and Supply Chain Management
18	C30162	Knowledge Management
19	A30473	Image Processing
20	A30474	Digital Electronics
21	A30357	Fundamentals of Manufacturing Processes
22	A30379	Fundamentals of Automobile Engineering
23	A30259	Electrical & Hybrid Vehicles



24	A30260	Electrical Safety
25	A30162	Green Buildings
26	A30163	Air Pollution and Control
27	C30163	Management of Industrial Relations
28	C30164	Entrepreneurship
29	A30475	Data Communications
30	A30476	Microcontrollers & Applications
31	A30382	Fundamentals of Mechanical Engineering
32	A30378	Waste to Energy
33	A30253	Fuel Cell Technology
34	A30255	Energy Efficiency in Electrical Utilities
35	A30164	Basic Civil Engineering
36	A30165	Sustainability Concepts in Civil Engineering
37	C30165	Basics of Insurance & Taxation
38	C30166	Business Ethics & Corporate Governance
39	A30477	Fundamentals of Embedded Systems
40	A30478	Sensors & Transducers
41	A30358	Industrial Safety Engineering
42	A30360	Work System Design
43	A30256	Energy Audit & Conservation
44	A30257	Nano Technology
45	A30166	Environmental Protection and Management
46	A30167	Alternate Building Materials
47	C30167	Marketing Management
48	C30168	Intellectual Property Rights

**Note:**

The above courses (Open Electives) are exclusively offered to students who have not studied the above courses (OEs) or their advanced courses as part of their Professional Electives or Professional Core Courses.

Non-CSE/IT-Mandatory Course		
S. No	Subject Code	Subject Name
1	A30560	INTRODUCTION TO ARTIFICIAL INTELLIGENCE

**(A30004) LINEAR ALGEBRA AND CALCULUS**

**(Common to all branches)**

**B. Tech CSE(AI&ML) I Semester**

$\frac{L}{3}$	$\frac{T}{1}$	$\frac{P}{0}$	$\frac{C}{4}$
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**UNIT-I**

**Matrices:** Types of matrices, Symmetric, Hermitian, Skew-symmetric, Skew-Hermitian, Orthogonal matrices, Unitary matrices, Rank of a matrix by echelon form and normal form, Inverse of non-singular matrices by Gauss-Jordan method, System of linear equations - solving system of homogeneous and non-homogeneous equations, Gauss elimination method, Gauss-Seidel iteration method.

**UNIT -II**

**Eigen values and Eigen vectors:** Eigen values, Eigen vectors and their properties, Diagonalization of a square matrix, Cayley-Hamilton theorem (without proof) - Inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and nature of the quadratic forms, Reduction of quadratic form to canonical form by linear and orthogonal transformations.

**UNIT -III**

**Sequences &Series:**

**Sequence:** Definition of a sequence, Limit, Convergent, Divergent and oscillatory sequences.

**Series:** Definition of a series, Convergent, Divergent and Oscillatory Series, Series of positive terms, Comparison test, P-test, D-Alembert's ratio test, Raabe's test, Cauchy's integral test, Cauchy's root test, Logarithmic test. **Alternating series:** Leibnitz test, Alternating convergent series, Absolute and conditionally convergence.

**UNIT -IV**

**Calculus:**

**Mean value theorems:** Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation and applications, Cauchy's mean value theorem, Taylor's series, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates),

**Improper Integral:** Beta, Gamma functions and their applications.

**UNIT -V**

**Multivariable calculus (Partial Differentiation and applications):** Definitions of Limit and continuity, Partial differentiation, Euler's Theorem, Total derivative, Jacobian, Functional

dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

**TEXT BOOKS:**

1. Higher Engineering Mathematics, (36<sup>th</sup> Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics, (9<sup>th</sup> Edition), Erwin kreyszig, John Wiley & Sons, 2006.

**REFERENCE BOOKS:**

1. Advanced Engineering Mathematics (3rd edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
2. Calculus and Analytic geometry, (9<sup>th</sup> Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008.
4. Higher Engineering Mathematics, (11<sup>th</sup> Reprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010.
5. Engineering Mathematics – I, T.K.V. Iyengar, B. Krishna Gandhi & Others, Edition S. Chand 2013 Yr.
6. Applied Mathematics for Engineers & Physicists (3<sup>rd</sup> edition) by Pipes & Harvill, McGraw Hill International Book company.

**COURSE OUTCOMES:**

On completion of the course students will be able to

1. Solve linear system represented by matrices.
2. Obtain eigen values, eigen vectors and diagonalization of a square matrix.
3. Analyse the nature of sequence and series.
4. Verify mean value theorems & evaluation of improper integrals by using Beta and Gamma functions
5. Find maxima & minima of functions of several variables.

**\*\*END\*\***

**(A30009) APPLIED PHYSICS**  
**(ECE, EEE, CSE)**

**B. Tech CSE(AI&ML) I Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	1	0	4

**UNIT-I**

**Principles of Quantum and Statistical Mechanics:** Waves and particles, de-Broglie hypothesis-Matterwaves, Davisson and Germer's Experiment, Heisenberg's Uncertainty principle, Physical significance of the wave function- (qualitative treatment) Schrödinger's time dependent and time independent wave equations, Particle in a one dimensional potential box- equations for energy and wave function, Concept of electron gas, Maxwell-Boltzmann, Bose –Einstein and Fermi–Dirac statistics(qualitative treatment). Density of energy states, Estimation of Fermi energy.

**UNIT-II**

**Semiconductor Physics:** Classification of materials into Conductors, Semiconductors & Insulators. Intrinsic Semiconductors-Concentration of electrons in the conduction band & concentration of holes in the valance band, Fermi level in intrinsic semiconductors, Law of mass action, Extrinsic semiconductors, N-Type semiconductor, Carrier concentration in N-Type semiconductors, P-Type semiconductors, Carrier concentration in P-Type semiconductors, drift and diffusion current, Hall effect.

**UNIT-III**

**Physics of Semiconductor Devices:** Formation of PN junction, Open circuit PN junction, Energy diagram of PN diode, I-V Characteristics of PN junction diode, Zener diode –breakdown mechanism and characteristics. Radiative and Non-Radiative recombination, LED, Photo diode & Solar cell-working principle & Applications, Semiconductor photo detectors- PIN and Avalanche structure and their characteristics.

**UNIT-IV**

**Lasers:** Characteristics of lasers, Absorption, spontaneous and stimulated emission of radiation, Einstein's coefficients and relation between them, Population inversion, Lasing action, Ruby laser, Helium-Neon laser, Semiconductor diode laser, Applications of lasers.

**Fiber Optics:** Principle of Optical fiber, Construction of optical fiber, acceptance angle and acceptance cone, Numerical Aperture, Types of optical fibers: Single and Multimode fibers, Step Index optical fibers & Pulse dispersion (qualitative treatment)

Graded index optical fibers & Pulse dispersion (qualitative treatment), Attenuation in optical fibers, optical fiber communication, optical fiber sensors.

#### UNIT-V

**Dielectric Properties:** Electric dipole, Dipole moment, Relative permittivity, Polarization and polarizability, Electric susceptibility, Displacement vector, Electronic and Ionic polarization, Orientation polarization (qualitative treatment), Internal fields in solids, Clausius–Mossottiequation, Piezo electric and Pyro-electric materials, Ferro electric materials.

**Magnetic Properties:** Permeability, Field intensity, Magnetic field induction, Magnetization, Magnetic Permeability & Susceptibility, Classification of Dia, Para, Ferro, Ferri and Anti-Ferro magnetic materials on the basis of magnetic moment (qualitative treatment), Explanation of Hysteresis curve on the basis of Domain theory of Ferro magnetism.

**Superconductivity:** Introduction, Critical field, Meissner effect, Effect of Magnetic field, Type-I and Type-II Superconductors, Cooper pair, BCS Theory of superconductivity (Qualitative treatment), Applications of Superconductors

#### TEXT BOOKS

1. Engineering Physics by B.K. Pandey, S. Chaturvedi- Cengage Learning India Pvt. Ltd., 1<sup>st</sup> Edition, 2012.
2. Engineering Physics by PK Palanisamy , SciTech Publications, 3<sup>rd</sup> edition, 2015.

#### REFERENCES

1. Fundamentals of Physics by Halliday, R. Resnick and J. Walker, John Wiley and Sons, 6<sup>th</sup> edition, 2001.
2. Introduction to Quantum Physics by Eisberg and Resnick, John Wiley & Sons, 2<sup>nd</sup> edition, 1985.
3. Quantum mechanics by D.J Griffiths, Cambridge University press, 2<sup>nd</sup> edition, 2017.
4. Principles of Lasers by O.Svelto, Plenum publishing Corporation, 4<sup>th</sup> edition, 1998.
5. Physics of Semiconductor devices by Simon.MSze and Kwok K . Ng, Wiley Student Edition, 3<sup>rd</sup> edition, 2006.

**COURSE OUTCOMES :**

On completion of the course students will be able to:

1. Explain the basic concepts of quantum & statistical mechanics.
2. Describe the classification of solids and the properties of semiconductors for device designing.
3. Understand the different semiconductor devices and circuits for optical communication
4. Interpret the basic properties of lasers and characteristics of optical fibers for modern communication
5. Acquire knowledge on properties of dielectric,,magnetic materials & illustrate the basic principles of superconductivity.

**\*\*END\*\***

**(A30501) PROGRAMMING FOR PROBLEM SOLVING**  
**(Common to all branches)**

**B. Tech (CSE-AIML) I Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT -I**

**Introductory Concepts:** Introduction to Computers, Computer Characteristics, Modes of Operation, Types of Programming Languages.

**Idea of Algorithm:** Steps to solve logical and numerical problems.

**Representation of Algorithm:** Flowchart/ Pseudo code with examples.

**Algorithms to programs:** Source code, variables (with data types), variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

**Introduction to C:** Some Simple C Programs, Desirable Program Characteristics.

**C Fundamentals:** The C Character Set, Identifiers and Keywords, Data Types, Constants Variables and Arrays Declarations, Expressions, Statements, Symbolic Constants.

**Preparing and Running a Complete C Program:** Planning a C Program, writing a C Program, Entering the Program into the Computer, Compiling and Executing the Program, Error Diagnostics, Debugging Techniques.

**Operators and Expressions:** Unary Operators, Arithmetic Operators, Relational and Logical Operators, Bitwise Operators, Conditional Operator, Assignment Operators, Special Operators, Precedence & Associativity of Operators, Evaluation of Expressions.

**Data Input and Output:** Preliminaries, Single Character Input- The getchar Function, Single Character Output- The putchar Function, Entering Input Data- The scanf Function, More About the scanf Function, Writing Output Data- The printf Function, More About the printf Function, The gets and puts Functions.

**UNIT -II**

**Control Statements:** Preliminaries, Branching: The if-else Statements, looping: The while Statement, the do while Statement, the for Statement, Nested Control Structures, the switch Statement, the break Statement, the continue Statement, the goto Statement.

**Arrays:** Defining an Array, Processing an Array, Multidimensional Arrays.



### UNIT -III

**Functions:** A Brief Overview, defining a Function, accessing a Function, Function Prototypes, Passing Arguments to a Function, Recursion, Passing Arrays to Functions.

**Program Structure:** Storage Classes- Automatic Variables, External Variables, Static Variables and Register Variables, Multi files Programs, More about Library Functions.

**Strings:** String Handling Functions, Sample C Programs without using library functions.

### UNIT -IV

**Pointers:** Fundamentals Pointer Declarations, Passing Pointers to Functions, Pointers and One-Dimensional Arrays, Dynamic Memory Allocation, Operations on Pointers, Pointers and Multidimensional Arrays, Arrays of Pointers, Passing Functions to other Functions, More about Pointer Declarations.

**Structures and Unions:** Defining a Structure, processing a Structure, User Defined Data Types- typedef & Enumerations, Structures and Pointers, Passing Structures to Functions, Bit fields, Self-Referential Structures and Unions.

### UNIT -V

**Data Files:** Opening and Closing a Data File, creating a Data File, Processing a Data File, Unformatted Data Files and Command Line Parameters.

**Searching and Sorting:** Linear and Binary Search, Bubble Sort, Selection Sort and Insertion Sort.

#### Text Books

1. Byron Gottfried, Schaum's Outline series, "Programming with C", McGraw-Hill.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

#### Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

### **Course Outcomes**

The student shall be able

1. Write algorithms and to draw flowcharts for solving problems.
2. Convert the algorithms/flowcharts to C programs.
3. Code and test a given logic in C programming language.
4. Decompose a problem into functions and to develop modular reusable code.
5. Write C programs using arrays, pointers, strings and structures and perform searching and sorting the data.

**\*\*END\*\***

**(A30313) ENGINEERING DRAWING**

**B. Tech (CSE-AIML) I Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
1	0	3	2.5

**Unit – I**

**Introduction to Engineering Drawing:** Principles of Engineering Drawing and their Significance; Conic Sections (Using eccentricity method only) Cycloid, Epi cycloid and Hypocycloid.

**Unit – II**

**Orthographic Projections:** Principles of Orthographic Projections – Conventions – Projections of Points and Lines (Excluding traces of lines) Projections of Plane regular geometric figures. (Excluding Auxiliary Planes and traces of planes)

**Unit – III**

**Projections of Solids:** Projection of regular solids- cube, Cylinder, prisms, pyramids, cone (Excluding Auxiliary Planes).

**Unit-IV**

**Isometric Projections: Principles** of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Solids and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts and combinations

**Unit-V**

**Transformation of Projections:** Conversion of Isometric Views to Orthographic Views and Vice-versa.

**Text Books:**

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.

**Reference Books:**

1. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
2. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

### **Course Outcomes**

#### **At the end of the Course, the student will be able to:**

1. Understand and apply the use of engineering curves in tracing the part of different machine components.
2. Evaluate the concepts of projections and acquire knowledge of visualization skills and convert it into pictorial representation.
3. Create and analyze the 3-D objects of machine components in real world.
4. Explore and evaluate the internal architecture of product by section and development of surfaces.
5. Create and imagine the solid and real objects in real world with axonometric projection.

**\*\*END\*\***

**(A30023) APPLIED PHYSICS LAB**

**B. Tech (CSE-AIML) I Semester**

$\frac{L}{0}$      $\frac{T}{0}$      $\frac{P}{3}$      $\frac{C}{1.5}$

**(Any 8 experiments are to be performed)**

1. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material.
7. LASER: To study the characteristics of LASER sources.
8. Optical fibre: To determine the Numerical aperture of a given fibre and bending losses of Optical fibres.
9. LCR Circuit: To determine the Quality factor of LCR Circuit.
10. Diffraction grating: Determination of wavelength of a source (LASER).
11. Determination of Planck's constant using LED.
12. R-C Circuit: To determine the time constant of R-C circuit.

**LABORATORY MANUAL:**

1. Laboratory Manual of Engineering Physics by Dr.Y. Aparna & Dr.K. VenkateswaraRao (V.G.S Publishers).
2. Laboratory Manual of Engineering, Published by CMR College of Engineering & Technology

**Course Outcomes**

At the end of the course the student will be able to

1. Explain the concept of oscillations and resonance.
2. Determine energy gap of a semiconductor diode, Planck's constant and magnetic fields.
3. Describe the characteristics of semiconductor devices
4. Design new experiments in engineering.
5. Evaluate the basic properties of lasers and optical fibers.

**\*\*END\*\***

**(A30502) C PROGRAMMING LAB**  
**(Common to all branches)**

**B. Tech (CSE-AIML) I Semester**

L	T	P	C
0	0	3	1.5

**Lab 1:** Familiarization with programming environment

- Write a simple C program to display "Hello, World!" on the screen
- Identify various parts in C program.
- Compile & Run the C- Program using various Compilers.
- Identify Syntax Errors and correct them.

**Lab 2:** Simple computational problems using arithmetic expressions

- Write a C program to find the roots of a quadratic equation.
- Write a C program to convert centigrade to Fahrenheit.

**Lab 3:**

- Write a C program to find maximum of given three numbers.
- Write a C program to find the factorial of a positive integer.

**Lab 4:**

- Write a C program to determine if the given number is a prime number or not.
- A Fibonacci sequence is defined as follows:  
the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to print the Fibonacci sequence up to  $n^{\text{th}}$  term.

**Lab 5:**

- Write a C program to generate all the prime numbers between 1 and  $n$ , where  $n$  is a value supplied by the user using Sieve of Eratosthenes algorithm.
- Write a C program to convert a positive integer to a roman numeral. Ex. 11 is converted to XI.

**Lab 6:**

- i. Write a C program to print the Pascal triangle pyramid
- ii. Write a C program to calculate the following series
  - a)  $\sin(x)$
  - b)  $\cos(x)$
  - c)  $\log(x)$

**Lab 7:**

- i. Write a C program that reads two matrices and uses functions to perform the following:
  - a) Addition of two matrices
  - b) Multiplication of two matrices
  - c) Transpose of a Matrix.
- ii. Define four pointer variables, one each of type char, short, int, float. Fill these pointers by allocate memory of required size by calling malloc () function. Read data from the user and fill in the memory (allocated using malloc ()). Finally display the data

**Lab 8:**

Write a C program to read N students data (Rollo, Name, Marks1, Marks2, Marks3) and find the topper (Use array of structures and implement using functions).

**Lab 9:**

- i. Write a C program that reads 15 names each of up to 30 characters, stores them in an array and use an array of pointers to display them in ascending (ie. alphabetical) order.
- ii. Two's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

**Lab 10:**

- i. Write a C program to display the contents of a file to standard output device.
- ii. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents

**Lab 11:**

- i. Write a C program that uses non-recursive functions to count the number of palindromes in a given string.
- ii. Write a C program to replace a substring with another in a given line of text.

**Lab 12:**

i. Write C programs for implementing the following methods

a) BubbleSort   b) Selection Sort   c) BinarySearch

**Additional Programs:**

1. Write a C program that implements the Insertion sort method to sort a given list of integers in ascending order.
2. Write a C program that uses functions to perform the following operations:
  - 2.1 To insert a sub-string into a given main string from a given position.
  - 2.2 To delete n characters from a given position in a given string.
3. Write a C program to compare two files, printing the first line where they differ.
4. Write a C program to reverse the first n characters in a file.

The file name and n are specified on the command line. Use fseek () function

5. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

**REFERENCE BOOKS:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

**Course outcomes**

The student shall be able

1. To test and execute the programs and correct syntax and logical errors.
2. To implement conditional branching, iteration and recursion.
3. To use arrays and structures to formulate algorithms and programs.



4. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
5. Create, read and write to and from simple text and binary files and verify through execution.

**(A30505) BASIC INTERNET OF THINGS LAB**  
(Common to all branches)

B. Tech (CSE-AIML) I Semester

$\frac{L}{0}$     $\frac{T}{0}$     $\frac{P}{2}$     $\frac{C}{1}$

**Lab Requirements:**

Raspberry Pi3 single board Computer, Android SDK, Eclipse IDE, JDK1.8.

**Week 1: Introduction to IoT**

- Definition of IoT
- History of IoT
- IoT Architecture
- Enabling Technologies for IoT
- Fundamental characteristics of IoT
- Benefits and Applications of IoT
- Introduction to Basic Components

Basic Components				
Jumper wires	LEDs (Light Emitting Diodes)	Resistors	Potentiometer	Diode,
Photo resistor	Buzzer	Temperature Sensor	DC Motor	Push Button
RC Servo	Relays	Breadboard		

**Week 2: Programming in python**

- Introduction to Python
- Python Installation
- Understanding Python Basics
- Using Arithmetic in your programs
- Learning about Loops

### **Week 3: Platform Based Development – Raspberry Pi**

Introduction to Raspberry Pi

- Why Raspberry Pi?
- Setting up the Raspberry Pi
- Python on Raspberry Pi

### **Week 4: Basic Experiments Level-1**

Demonstration of the following Experiments

Experiment 1: Your First Circuit – To Blink an LED (Light Emitting Diode)

Experiment 2: To Blink an RGB LED

### **Additional Experiments (optional)**

Experiment 1: To read the temperature and display the same in serial monitor.  
(use LM35 Temperature sensor)

Experiment 2: To make an LED glow when controller detects a button pressed.

### **Week 5: Basic Experiments Level -2**

Demonstration of the following Experiment

Experiment 1: To control an LED according to the range of analog input sensed using photo resistor. (use Light DependantResistor (LDR))

### **Additional Experiments (optional)**

Experiment 1: To interface the Liquid Crystal Display (LCD) with the Raspberry Pi3 to display the characters on the LCD.

### **Week 6: Basic Experiments Level -3**

Demonstration of the following Experiment

Experiment1: To interface the Ultrasonic Sensor with the Raspberry Pi3 to determine the distance of an object from the sensor.

### **Additional Experiments (optional)**

**Experiment1:** To interface the Infrared sensor with the Raspberry Pi3 to sense the path is clear/indicate the presence of any obstacles.

### **Week 7: Introduction to Android**

- Introduction to Android
- Explain the structure of Android App.

**Experiment 1:** Create Hello World application with Android.

### **Week 8**

**Experiment 1:** Create Application to change the Background Color and Background Image

**Experiment 2:** Explain simple User interface components in Android and create simple Application

### **Week 9**

**Experiment 1:** Create an application that display color or image as background when selected the radio buttons or checkboxes

**Experiment 2:** Create an Application to perform addition, Subtraction, multiplication, division.

### **Week 10**

Explain what is activity, intent and its functions.

**Experiment 1:** Create an application with Android intent.

### **Week 11**

**Experiment 1:** Create a simple android application with the following event handlers.

- a) On Click
- b) On Key Down
- c) On Focus changed

### **Week 12**

**Experiment 1:** Explain about Toast, Create Application with User defined Toast Notifications.

**Additional Experiment:** Create login page by using login activity

**Reference Books:**

1. ArshdeepBahga, VijayMadiseti, Internet of Things: A Hands-On Approach, Orient Blackswan Private Limited - New Delhi; First edition (2015)
2. John Horton, Android Programming for Beginners, PACKT publications.

**Course Outcomes:**

At the end of the course the student will be able to:

1. Identify and differentiate various components used in IoT Architecture.
2. Write & execute programs in python programming language
3. Use Python programming language to interface with Raspberry
4. Demonstrate the various real time applications using Raspberry Pi
5. Create and Deploy Mobile applications using Android

**\*\*END\*\***

**(A30020) INTRODUCTION TO SOCIAL INNOVATION**

**(Common for all branches)**

**B. Tech (CSE-AIML) I Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	2	1

**UNIT 1**

**Community Study:** Types and features of communities- Rural, Suburban, Urban and regional, Service based learning, Aims of community-based projects, Community visits.

**UNIT 2**

**Social Innovation across Four Sectors:** The four sectors – the non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors.

**UNIT 3**

**Stages of Social Innovation:** Social organizations and enterprises, social movements, politics and government, markets, academia, philanthropy, social software and open source methods, common patterns of success and failure.

**UNIT 4**

**Engineering Ethics:** Introduction to ethics, moral values, significance of professional ethics, code of conduct for engineers, identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

**UNIT 5**

Steps for Patent filing and Startups, poster presentation.

**References:**

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public Sectors; Georgia Levenson Keohane; Tata McGraw Hill
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, Yeheskel Hasenfeld; Palgrave Macmillan
3. Engineering Ethics: An Industrial Perspective; Gail Baura; Elsevier

4. Intellectual Property and Financing Strategies for Technology Startups; Gerald B. Halt, Jr., John C. Donch, Jr., Amber R. Stiles, Robert Fesnak; Springer
5. Fundamentals of Intellectual Property (English) 1st Edition (Paperback, Dr. Kalyan C. Kankanala) Publisher: Asia Law House ISBN: 9789381849514, 938184951X Edition: 1st Edition, 2012.
6. Indian Patent Law (English, Paperback, Kalyan C. Kankanala) Publisher: Oxford University Press- New Delhi, ISBN: 9780198089605, 0198089600 Edition: 2012.

**Course Outcomes:**

**On Completion of the course, the students will be able to**

1. Identify community issues through community Interaction
2. Illustrate the factors affecting social innovation in various sectors
3. Analyze the stages of social innovation for a community problem
4. Adopt the ethical values in implementing the Social innovation
5. Describe the process of property rights and patent filing.

**\*\*END\*\***

**(A30005) Ordinary Differential Equations and Multivariable Calculus**  
**(Common to all branches)**

**B. Tech (CSE-AIML) II Semester**

**$\frac{L}{3}$     $\frac{T}{1}$     $\frac{P}{0}$     $\frac{C}{4}$**

**UNIT-I**

**First Order ODE:** Exact, Linear and Bernoulli's differential equations, Applications, Newton's law of cooling, Law of natural growth and decay.

**Equations not of first degree:** Equations solvable for p, Equations solvable for y, Equations solvable for x and Clairaut's type.

**UNIT -II**

**Ordinary Differential Equations of Higher Order:** Second and higher order linear differential equations with constant coefficients, Non-Homogeneous terms of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$  and  $x V(x)$ , Method of variation of parameters, Equations reducible to linear ODE with constant coefficients, Legendre's equation, Cauchy-Euler equation.

**UNIT -III**

**Multivariable Calculus (Integration):** Evaluation of Double Integrals (Cartesian and polar coordinates), Change of order of integration (only Cartesian form), Evaluation of Triple Integrals, Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals, **Applications:** Areas (by double integrals) and volumes (by double integrals and triple integrals).

**UNIT -IV**

**Vector Differentiation:** Vector point functions and scalar point functions, Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

**UNIT -V**

**Vector Integration:** Line, Surface and volume Integrals. Theorems of Green's, Gauss and Stoke's (without proofs) and their applications.



**TEXT BOOKS :**

1. Higher Engineering Mathematics, (36<sup>th</sup> Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics, (9<sup>th</sup> Edition), Erwin kreyszig, John Wiley & Sons, 2006.

**REFERENCE BOOKS:**

1. Advanced Engineering Mathematics (3rd edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
2. Differential Equations with Applications & Historical Notes(2<sup>nd</sup>Edi) by George F Simmons, [Tata Mc. graw Hill Publishing Co Ltd.](#)
3. Advanced Engineering Mathematics(8<sup>th</sup>Edition) by Kreyszig, John Wiley & Sons Publishers
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry(9<sup>th</sup>Edition), Pearson, Reprint, 2002
5. Mathematics for Engineering and Scientists (6<sup>th</sup> Edi), by. Alan Jeffrey, 2013, Chapman & Hall / CRC
6. Engineering Mathematics – I by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2012 Yr. Edition S. Chand.
7. Differential Equations (3rd Ed), S. L. Ross Wiley India, 1984.

**COURSE OUTCOMES:**

**On completion of the course students will be able to**

1. Determine first order differential equations and obtain solutions.
2. Solve higher order linear differential equations using various methods.
3. Evaluate areas and volumes using multiple integrals.
4. Evaluate Gradient, Divergence, Curl and directional derivatives.
5. Evaluate integrals by converting line to surface integral and surface to volume integrals.

**\*\*END\*\***

(A30001) ENGLISH

B. Tech (CSE-AIML) II Semester

$\frac{L}{2}$	$\frac{T}{0}$	$\frac{P}{0}$	$\frac{C}{2}$
---------------	---------------	---------------	---------------

**UNIT-I:**

**Reading:** On the Conduct of Life: William Hazlitt from “Language and Life: A Skills Approach” Published by Orient Black Swan, Hyderabad.

**Grammar:** Prepositions

**Vocabulary:** Word Formation I: Introduction to Word Formation

**Writing:** Clauses and Sentences

**UNIT-II:**

**Reading:** The Brook: Alfred Tennyson from “Language and Life: A Skills Approach” Published by Orient Black Swan, Hyderabad.

**Grammar:** Articles

**Vocabulary:** Word Formation II: Root Words from Other Languages

**Writing:** Punctuation

**Life Skills:** Self Improvement- ‘How I Became a Public Speaker’: George Bernard Shaw

**UNIT-III:**

**Grammar:** Noun-Pronoun Agreement, Subject-Verb Agreement

**Vocabulary:** Word Formation III: Prefixes and Suffixes from Other Languages

**Writing:** Principles of Good Writing

**Life Skills:** Time Management- ‘On Saving Time’: *Seneca*

**UNIT-IV:**

**Grammar:** Misplaced Modifiers

**Vocabulary:** Synonyms and Antonyms

**Writing:** Essay Writing

**Life Skills:** Innovation- Muhammad Yunus – A biography

**UNIT –V:**

**Reading:** Politics and English Language: George Orwell from “Language and Life: A Skills Approach” Published by Orient Black Swan, Hyderabad.

**Grammar:** Clichés, Redundancies

**Vocabulary:** Common Abbreviations

**Writing:** Writing a Summary

**TEXTBOOKS:**

1. A Text book entitled “**Language and Life: A Skills Approach**” Published by Orient Black Swan, Hyderabad. ISBN:978-93-5287-422-4

**REFERENCES:**

1. Practical English Usage. Michael Swan. OUP. 1995
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

**COURSE OUTCOME:**

At the end of the course the student will be able to:

1. Apply the rules of Noun-Pronoun Agreement, Subject-Verb Agreement in sentence formation.
2. Identify the Root Words from other Languages and describe the methods of word formation in English Language.
3. Employ Synonyms, Antonyms, Affixation and Acronyms in writing and Speaking correct English
4. Compose essays and summaries in English and apply time management Skills to make best use of time.
5. Apply the public speaking skills in giving presentations and speeches in English

**\*\*END\*\***

**(A30011) ENGINEERING CHEMISTRY****B.Tech(CSE-AIML)IISemester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**UNIT-I****Molecular Structure and Theories of Bonding:**

Introduction, Concept of atomic and molecular orbitals, Linear combination of atomic orbitals (LCAO), Molecular orbitals of diatomic molecules, Molecular orbital energy level diagrams of diatomic molecules-  $N_2$ ,  $O_2$  and  $F_2$ ,  $\pi$  –molecular orbitals of butadiene and benzene.

**Crystal Field Theory (CFT):**

Salient features of CFT, Crystal field splitting patterns of transition metal ion d-orbitals-tetrahedral, octahedral and square planar complexes.

**UNIT-II****Electrochemistry:**

Introduction, Conductance- Specific conductance, Equivalent conductance, Molar conductance and their inter relationship, Numerical problems, Electrochemical cell, Electrode potential, Standard electrode potential and E.M.F of the cell, Nernst equation- derivation and applications, Types of electrodes- Quinhydrone electrode, Calomel electrode and Glass electrode. Electrochemical series and its applications. Concept of concentration cells, Electrolytic concentration cell and numerical problems, Batteries- primary (Lithium cell), secondary (Lead acid storage battery and Lithium ion battery) and Fuel cells( $H_2$ - $O_2$  and methanol-oxygen).

**Corrosion:**

Causes and effects of corrosion, Theories of chemical and electrochemical corrosion, Mechanism of electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion- Galvanic, Waterline and Pitting corrosion, Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection, Sacrificial anode and Impressed current cathodic methods, Surface coatings- Metallic coatings, hot dipping, galvanizing and tinning, Electroplating- Copper plating and electroless plating - Nickel plating.

**UNIT –III****Spectroscopic Techniques and Applications:**

Principles of spectroscopy and selection rules, Applications of UV-Visible spectroscopy, Vibrational and rotational spectroscopy (IR spectroscopy)-Applications, Nuclear magnetic

resonance-Chemical shift, Splitting pattern and Integration, Introduction to magnetic resonance imaging.

#### **UNIT-IV**

##### **Water Technology:**

Sources of water, Impurities in water, Hardness of water, Temporary and permanent hardness, Units of hardness, Estimation of temporary and permanent hardness of water, EDTA method, Numerical problems, Potable water treatment-Specifications, Steps involved in treatment-Sedimentation, Coagulation, Filtration, Sterilization, Desalination of Brackish Water, Reverse Osmosis and Electro dialysis.

Industrial water treatment, Boiler Troubles-Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming. Hot lime and cold lime soda process-Numerical problems, Zeolite process and Ion exchange process. Internal conditioning methods like Phosphate, Carbonate, Calgon and Colloidal conditioning.

#### **UNIT-V**

##### **Stereochemistry:**

Representations of three-dimensional structures, Structural isomers and stereoisomers, Configurations and symmetry, Chirality- Enantiomers, Diastereomers, Optical activity, Absolute configurations and conformational analysis of n-butane.

##### **Organic Reaction Mechanisms and Synthesis of a Drug Molecule:**

Introduction, Substitution reactions- Nucleophilic substitution reactions (Mechanisms of  $SN^1$  and  $SN^2$  reactions, Addition Reactions-Electrophilic and nucleophilic addition reactions, Addition of HBr to propene, Markovnikov and anti Markovnikov's additions, Grignard additions on carbonyl compounds, Elimination reactions- Dehydrohalogenation of Alkyl halides, Saytzeff rule.

Oxidation reactions- Oxidation of Alcohols using  $KMnO_4$  and chromic acid, Reduction reactions-reduction of carbonyl compounds using  $LiAlH_4$ ,  $NaBH_4$ , Synthesis of a commonly used drug molecules (Paracetamol and Ibuprofen).

##### **Text Books:**

1. "Engineering Chemistry", P.C Jain and Jain Monika, Dhanpat Rai Publication Company, 16<sup>th</sup> Edition, 2015.
2. Text Book of Engineering Chemistry by A.Jaya Shree, Wiley India Pvt. Ltd, New Delhi.

##### **Reference Books:**

1. University chemistry, by B. H. Mahan, Narosa Publication. 1998.

2. Chemistry: Principles and Applications, by M. J. Sienko and R.A. Plane, McGraw-Hill, 3<sup>rd</sup> edition, 1980.
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell, McGraw-Hill, 3<sup>rd</sup> revised edition, 1983.
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan.
5. Physical Chemistry, by P. W. Atkins, W.H. Freeman and Company, 5<sup>th</sup> Edition, 1994.
6. “Text Book of Engineering Chemistry”, B.Rama Devi, Ch. VenkataRamana Reddy and PrasanthRath,Cengage Learning 2017.
7. “Organic Chemistry”, Morison and Boyd, Pearson publications, 7<sup>th</sup> Edition 2011.
8. Organic Chemistry: Structure and Function by K.P.C.Volhardt and N.E.Schore,5<sup>th</sup>Edition <http://bcs.whfreeman.com/vollhardtschore5e/default.asp>

**Course Outcomes:**

**After completion of the course students will be able to**

1. Explain the benefits of treated water as source in steam generation in industrial applications.
2. Describe how electrochemical concepts can be used in various practical applications, like batteries, fuel cells etc.
3. Apply knowledge of corrosion science to problems in materials engineering.
4. Explain various methods of prevention of corrosion of metals.
5. Explain the chemical applications of electricity

**.\*\*END\*\***

**(A30503) DATA STRUCTURES & ALGORITHMS**

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

**B. Tech (CSE-AIML) II Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT - I**

**Data Structures:** Introduction, classification of Data structures, ADT and applications, Over view of List and its operations.

**Linked Lists:** Representation in memory, Operations of Singly Linked List: Traversing, Searching, Insertion, Deletion and Reverse, Doubly Linked List and its Operations, Circular Linked Lists and its Operations.

**UNIT - II**

**Stacks:** Stack ADT and its implementations, Applications of Stacks: Infix to Postfix Conversion and Postfix evaluation – Corresponding algorithms.

**Queues:** Queue ADT and its implementations, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues- Corresponding Algorithms.

**UNIT - III**

**Trees:** Basic Tree Terminologies, Representations, types of Binary Trees: Threaded Binary Tree, Binary Search Tree, AVL Tree and their operations: Insertion Deletion, Traversal.

**UNIT – IV**

**Graphs:** Basic Terminologies, Representations, Graph traversal algorithms.

**Dictionaries:** Dictionary as a linear list and its operations-Insertion, Deletion, Searching, Hash tables, Hash Functions, Collision Resolution Techniques-Linear Probing, Quadratic Probing, and Double Hashing.

**UNIT V**

**Sorting:** Quick Sort, Merge Sort, Heap Sort, comparison of techniques.

**Pattern Matching Algorithms:** Brute-Force Algorithm and Knuth-Morris-Pratt Algorithm.

**Text books:**

1. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures in C, Second Edition Universities Press.
2. Thomas H. Cormen Charles E. Leiserson, Introduction to Algorithms, PHI Learning Pvt. Ltd. Third edition.

**Reference books:**

1. Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. E.[Balagurusamy](#) Data Structures Using C, McGraw Hill Education; First edition

**Course Outcomes:**

On completion of the course students will be able to

1. Use data structure concepts for realistic problems.
2. Identify appropriate data structure for solving computing problems in respective language
3. Develop algorithms, operations on queues, stacks and Linked Lists.
4. Demonstrate the representation and traversal techniques of graphs and their applications
5. Analyze and Implement searching and sorting algorithms

**\*\*END\*\***



**(A30002) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB**

**B. Tech (CSE-AIML) II Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	3	1.5

**English Language Communication Skills Lab** shall have two parts

**A. Computer Assisted Language Learning (CALL) Lab**

**B. Interactive Communication Skills (ICS) Lab**

**INTRODUCTION:**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

**EXERCISE – I**

**CALL Lab:** Introduction to Phonetics – Speech Sounds – Vowels and Consonants

**ICS Lab:** Ice-Breaking activity and JAM session

**EXERCISE – II**

**CALL Lab:** Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.

**ICS Lab:** Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.

**EXERCISE – III**

**CALL Lab:** Minimal Pairs- Word accent and Stress Shifts.

**ICS Lab:** Descriptions – Place, Person, Object

**EXERCISE – IV**

**CALL Lab:** Intonation and Common errors in Pronunciation.

**ICS Lab:** Extempore- Public Speaking

**EXERCISE – V**

**CALL Lab:** Neutralization of Mother Tongue Influence and Conversation Practice

**ICS Lab:** Giving Directions

**COURSE OUTCOMES:**

**At the end of the lab session, learner comprehends, acquaints and adopts the following.**

1. Illustrates How to Work in Teams and demonstrates Soft Skills and communication Skills well.
2. Minimizes the usage of Mother Tongue and Apprises Neutral Accent
3. Prepares for employability skills
4. Speaks English confidently and does Presentations with self-confidence
5. Distinguishes between Sympathy and Empathy

**\*\*END\*\***

**(A30012) ENGINEERING CHEMISTRY LAB****B. Tech (CSE-AIML) II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

1. Estimation of Hardness of water by EDTA method.
2. Estimation of Alkalinity of water.
3. Estimation of Copper by Colorimetric Method.
4. Conductometric Titration of a strong acid vs a strong base.
5. Conductometric Titration of a weak acid vs a weak base.
6. Potentiometric Titration of a strong acid vs a strong base.
7. Potentiometric Titration of weak acid vs a weak base.
8. Preparation of Paracetamol and Aspirin.
9. Determination of Viscosity of a Liquid.
10. Determination of Surface Tension of a liquid.
11. Adsorption of acetic acid on Activated charcoal.
12. Estimation of iodine in table salt.
13. Thin Layer Chromatography (Ortho-Nitro phenol & Para-Nitro phenol).
14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

**REFERENCES:**

1. Engineering Chemistry Lab Manual, Glaze Publishers 2018.
2. Engineering chemistry by B. Rama Devi & Ch. Venkata Ramana Reddy; Cengage Learning, 2012.
3. Textbook of Engineering Chemistry, Sashi Chawla, Dhanapathi & Sons.

**Course outcomes:**

At the end of the course the student will be able to:

1. Predict the extent of hardness range present in water sample and its Consequences in industrial operations
2. Prepare drugs like Aspirin and Paracetamol
3. Estimate the strength of solutions, pH of various solutions
4. Evaluate the viscosity and surface tension of liquids
5. Employ the conductometric and potentiometric titrations

**\*\*END\*\***

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**(A30504) DATA STRUCTURES & ALGORITHMS LAB**  
(Common to ECE, CSE, EEE, IT)

**B. Tech (CSE-AIML) II Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	3	1.5

**Lab 1:** Write a C program to perform the following operations on the given array

- (i) insert element in specific position in to array
- (ii) Delete random element from array
- (iii) Reverse the array elements

**Lab 2:** A) Write a C program to implement Single linked list

- i) Insertion      ii) Deletion      iii) Display

B) Write a C program to implement Circular linked list

- i) Insertion      ii) Deletion.      iii) Display

**Lab 3:** A) Write a C program to implement Doubly linked list

- i) Insertion      ii) Deletion.      iii) Display

B) Write C programs to implement Stack ADT using

- i) Array      ii) LinkedList

**Lab 4:**

- A. Write a C program that uses stack operations to convert a given infix expression in to its postfix equivalent. (Display the role of stack).
- B. Write a C program for Evaluation of postfix expression.

**Lab 5:** Write C programs to implement Queue ADT using

- i) Array ii) Linked List

**Lab 6:** Write a C program to implement Binary search tree

- i) Insertion ii) deletion iii) Traversals

**Lab 7:**

Write a C program to implement binary search tree Non - recursively traversals

- i) Pre- Order      ii) Post -Order      iii) In-Order

**Lab 8:**

(A) Write a C Program to Check if a Given Binary Tree is an AVL Tree or Not

(B) Write a C program to find height of a Binary tree

(C) Write a C program to count the number of leaf nodes in a tree.

**Lab 9:**

Write a C program for implementing Graph traversal

- i) DFS                      ii) BFS

**Lab 10:**

A) Write a C program to implement different hash methods

B) Write a C program to implement the following collision resolving

- i) Quadratic probing. ii) Linear Probing

**Lab 11:**

Write C programs for implementing the following Sorting methods and display the important steps.

- i) Quick Sort                      ii) Heap sort

**Lab 12:**

Write a C program for implementing pattern matching algorithms

- i) Knuth-Morris-Pratt                      ii) Brute Force

**Additional**

1. Implement the priority queue using Heap
2. Write a C Program to Implement Merge sort
3. Write a C program to implement AVL tree
  - i) Creation
  - ii) Deletion
  - iii) Traversals
4. Write a function to reverse the nodes of a linked list
5. Write a C program to implement 2-3-4 tree operations
6. Write a C program to implement B tree operations
7. Write a C program to implement B+ tree operations

**Reference Books:**

1. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures in C, Second Edition Universities Press.
2. Thomas H. Cormen Charles E. Leiserson, Introduction to Algorithms, PHI Learning Pvt. Ltd. Third edition.
3. Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
4. [E.Balagurusamy](#) Data Structures Using C, McGraw Hill Education; First edition

### **Course Outcomes**

At the end of the course the student will be able to

1. Write and execute C-programs to implement Linked List Data Structures
2. Evaluate postfix expressions by implementing in C-language
3. Implement Non- linear Data Structures in C-language
4. Implement various sorting techniques in C-language
5. Test various pattern matching algorithms by implementing in C-language.

**(A30314) ENGINEERING WORKSHOP**

**B. Tech (CSE-AIML) II Semester**

**$\frac{L}{0}$     $\frac{T}{0}$     $\frac{P}{3}$     $\frac{C}{1.5}$**

**I Trade for Exercise:**

(Two experiments each from any six trades of the following)

1. Carpentry
2. Fitting
3. Tin-smithy
4. House-wiring
5. Foundry
6. Plumbing
7. Welding
8. Black smithy

**II Trades for Demonstration and Exposure:**

1. Power tools
2. Machine Tools- Turning on Lathe and other Operations on Lathe.,

**TEXT BOOK:**

1. Workshop Manual, Second edition/ P Kannaiah and K L Narayana/ Scitech publishers

**Course Outcomes**

On completion of the course students will be able to:

1. Create the different patterns with desired shape and size by using wood.
2. Align and assemble different components to create a product by fitting operations.
3. Fabricate the given material to desired product in a particular pattern by tin smithy.
4. Understand the basic principles of electrical systems in day-to-day applications.
5. Mould the component to desired pattern and shape by black smithy.

**\*\*END\*\***

**(A30019) ENGINEERING EXPLORATION & PRACTICE**

**(Common to all branches)**

**B. Tech (CSE-AI ML) II Semester**

L	T	P	C
0	0	3	1.5

**Module 1**

**Introduction to Engineering and Engineering Study:** Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer.

**Module 2**

**Engineering Design:** Engineering Design Process, Multidisciplinary facet of design, Importance of analysis in engineering design, general analysis procedure, Pair wise comparison chart, Introduction to mechatronics system, generation of multiple solution, decision matrix, Concepts of reverse engineering

**Module 3**

**Mechanisms:** Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism.

**Module 4**

**Platform based development:** Introduction to various platform-based development, programming and its essentials, Introduction to transducers and actuators and its interfacing. Concepts of reverse engineering

**Data Acquisition and Analysis:** Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of data acquisition tools for descriptive statistics, Data Acquisition, Exporting acquired data to analysis using visual representation



## Module 5

**Project Management:** Introduction, Significance of teamwork, Importance of communication in engineering profession, Project management tools: Checklist, Timeline, Gantt Chart, Significance of documentation

**Sustainability:** Introduction to sustainability, Sustainability leadership, Life cycle assessment, carbon footprint

### References:

1. Engineering Fundamentals: An Introduction to Engineering (MindTap Course List) 5th Edition by Saeed Moaveni
2. Software Project Management (SIE), (Fifth Edition); Bob Hughes, Mike Cotterell, Rajib Mall; Published by Tata McGraw-Hill Education Pvt. Ltd (2011) ; ISBN 10: 0071072748 ISBN 13: 9780071072748
3. A Ghosh and AK Malik: Theory of Mechanism and Machine; East West Press (Pvt) Ltd., New Delhi.
4. Arduino Cookbook, 2nd Edition by Michael Margolis: O'Reilly Media
5. Data Acquisition and Analysis - Building an Excel Budget Forecast Workbook by Andrew Greaney (Kindle Edition) ISBN: 1521903468
6. Concepts in Engineering Design – 2016; by Sumesh Krishnan (Author), Dr. Mukul Shukla (Author), Publisher: Notion Press

### Course Outcomes:

**On Completion of the course, the students will be able to:**

1. Explain the importance of engineering profession in the world.
2. Identify multi-disciplinary approach required in solving an engineering problem
3. "Build a mechanism for a given application"
4. Design a mechatronic system using arduino and electronic components
5. Analyze engineering solution from sustainability perspectives.

\*\*END\*\*

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**(A30506) DISCRETE MATHEMATICS****B. Tech (CSE-AI ML) III Semester**

L	T	P	C
3	0	0	3

**Unit-I**

Sets, Relations and Functions: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

**Unit-II**

**Principles of Mathematical Induction:** The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic. Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

**Unit-III**

**Propositional Logic:** Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

**Unit-IV**

**Algebraic Structures and Morphism:** Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

### **Unit-V**

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Coloring, Coloring maps and Planar Graphs, Coloring Vertices, Coloring Edges, List Coloring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

#### **Text books:**

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 7<sup>th</sup> Edition, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications, 4<sup>th</sup> edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3<sup>rd</sup> Edition by, Tata McGraw – Hill.

#### **Reference books:**

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, Tata McGraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2<sup>nd</sup> Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson,
3. Discrete Mathematics, Tata McGraw – Hill

### **Course Outcomes**

#### **On completion of the course students will be able to**

1. Identify various types of Sets, Relations and Functions.
2. Apply Principle of Inclusion and Exclusion technique.
3. Describe various methods of Proving a logical statement.
4. Classify various Algebraic Structures.
5. State the properties of Graphs & Trees.

**\*\*END\*\***

**(A30007) NUMERICAL TECHNIQUES & PROBABILITY DISTRIBUTIONS**  
(Common to CE, ME, CSE, IT)

**B. Tech (CSE-AIML) III Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	1	0	4

**UNIT-I: NUMERICAL METHODS-I**

**Solution of polynomial and transcendental equations:** Bisection method, Iteration method, Newton-Raphson method and Regula-False method.

**Interpolation:** Finite differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation, Gauss's forward and backward formulae, Lagrange's method of interpolation.

**UNIT-II: NUMERICAL METHODS-II**

**Numerical integration:** Trapezoidal rule, Simpson's 1/3rd and 3/8 rules.

**Numerical Solutions of Ordinary Differential Equations** -Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order.

**UNIT-III: LAPLACE TRANSFORMS**

Laplace transform of standard functions, First shifting theorem, Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transforms of special functions, Laplace transform of periodic functions. Inverse Laplace transform by different methods, Convolution theorem (without Proof), Solving ODEs by Laplace transform method.

**UNIT- IV:**

**RANDOM VARIABLES & DISTRIBUTIONS**

**Random Variables:** Discrete and continuous random variables.

**Distributions:** Binomial distribution, Poisson distribution and their Properties, Normal distribution, Sampling distribution of means ( $\sigma$  - known and unknown).

**UNIT- V:TEST OF HYPOTHESIS**

Test of hypothesis, Null hypothesis, Alternative hypothesis, Type-I & II errors, Critical region, Confidential interval for the mean & proportions. Test of

hypothesis for large samples, Single mean, Difference between the means, Single proportion and difference between the proportions. Test of hypothesis for Small samples, Confidence interval for the t- distribution, Tests of hypothesis t -test, F-test,  $\chi^2$ - test, goodness of fit.

**TEXT BOOKS:**

1. Higher Engineering Mathematics (36<sup>th</sup> edition) by B.S. Grewal, Khanna Publishers.
2. Fundamentals of Mathematical Statistics (11<sup>th</sup> Edition) by S.C. Gupta & VK Kapoor, Sultan Chand & Sons.

**REFERENCE BOOKS:**

1. Advanced Engineering Mathematics (3<sup>rd</sup> edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
2. Introductory Methods of Numerical Analysis, S.S. Sastry, 4<sup>th</sup> Edition, Prentice Hall of India Pvt. Ltd.
3. Advanced Engineering Mathematics (9<sup>th</sup> edition) by Erwin Kreyszig John Wiley & Sons Publishers.
4. Probability & Statistics by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2015 Yr. Edition S. Chand.
5. Applied Mathematics for Engineers & Physicists (3<sup>rd</sup> edition) by Pipes & Harvill, McGraw Hill International Book company.

**COURSE OUTCOMES:**

**On completion of the course students will be able to**

1. Find the root of given equation and estimate unknown value using interpolation.
2. Find numerical solutions of ordinary differential equations.
3. Solve ordinary differential equations using Laplace transform.
4. Analyse random variables involved in probability models.
5. Test hypothesis for large and small samples.

**\*\*END\*\***

**(A30513) COMPUTER ORGANIZATION & ARCHITECTURE**

**B. Tech (CSE-AIML) III Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	1	0	4

**Unit-1**

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs

**Unit-II**

Data representation: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

**Unit-III**

Introduction to x86 architecture. CPU control unit design: hardwired and micro-programmed design approaches, Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCSI, USB

**Unit-IV**

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency

**Unit-V**

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

**Text books:**

1. “Computer Organization and Design: The Hardware/Software Interface”, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. “Computer Organization and Embedded Systems”, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

**Reference books:**

1. “Computer Architecture and Organization”, 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. “Computer Organization and Architecture: Designing for Performance”, 10th Edition by William Stallings, Pearson Education.
3. “Computer System Design and Architecture”, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

**Course Outcomes**

**On completion of the course students will be able to**

1. Describe basic computer organization
2. Explain the design of Control Unit.
3. Illustrate Data representation in computer’s memory
4. Describe Input-Output, Memory Organization.
5. Distinguish between RISC and CISC Instruction Set.

**\*\*END\*\***

**(A36201) OBJECT ORIENTED PROGRAMMING THROUGH JAVA**

**B. Tech (CSE-AIML) III Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**Unit-I**

Introduction to Object Oriented Programming: Need for Object Oriented Programming - Characteristics of Object-Oriented Languages, Objects, Overloading, Overriding Functions and Object Polymorphism, Inheritance, Abstraction, Interfaces, java introduction & language fundamentals

Packages: Defining, Creating and Accessing a Package, Understanding Class path, Importing Packages

**Unit-II**

Inner Classes: Use of Inner Classes, Local Inner Classes, Anonymous Inner Classes, Static Inner Classes, Example.

Exception Handling: Dealing with Errors, Benefits of Exception Handling, The Classification of Exceptions, Exception Hierarchy, Checked Exceptions and Unchecked Exception, Usage of Try, Catch, Throw, Throws, and Finally, Re-Throwing Exceptions, Exception Specification, Built in Exceptions, Creating Own Exception Sub Classes.

**Unit-III**

Multithreading: Difference Between Multiple Processes and Multiple Threads, Thread States, Creating Threads, Interrupting Threads, Thread Priorities, Synchronizing Threads, Inter-Thread Communication, Producer Consumer Pattern.

File I/O: Streams-Byte Streams, Character Streams, Text Input /Output, Binary Input/output, File Management using File Class

**Unit-IV**

Collection Framework in Java: Introduction to Java Collections, Overview of Java Collection Frame Work, Generics, Commonly used Collection Classes-Array List, Vector, Hash Table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, Calendar and Properties.

Connecting to Database: JDBC Type I To IV Drivers, connecting to a Database, querying a Database and Processing the Results, Updating Data With JDBC.



## **Unit-V**

GUI Programming with Java: Introduction to Scala and Swing, Hierarchy for Swing and Scala Components, Containers JFrame, JApplet, JDialog, JPanel, Overview of Some Swing Components, JButton, JLabel, JTextfield, JTextarea, Simple Swing Applications, Layout Management- Layout Manager Types- Border Grid and Flow. Event Handling: Events, Event Sources, Event Classes, Event Listeners, Relationship Between Event Sources and Listeners, Delegation Event Model, Examples: Handling a Button Click, Handling Mouse Events, Adapter Classes.

## **Textbooks**

1. Java Fundamentals: A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.
2. Programming Development in Java, Barbara Liskov, Addison-Wesley

## **References**

1. Data Abstraction and Problem Solving with Java: Walls and Mirrors by Frank M. Carrano and Janet J. Prichard
2. Java for Programming, P.J. Dietel Pearson Education
3. Object Oriented Programming through Java, P. Radha Krishna, and Universities Press.
4. Thinking in Java, Bruce Eckel, Pearson Education
5. Programming in Java, S. Malhotra and S. Choudhary, Oxford University Press

## **Course Outcomes**

### **On completion of the course students will be able to**

1. Describe the characteristics of Object-Oriented Programming Languages.
2. Illustrate Java Exception Handling Mechanism
3. Develop applications using Java Multi-Thread Concept.
4. Use Java Collection Framework
5. Design GUI applications using Java Swings.

**\*\*END\*\***

**(A30228) BASIC ELECTRICAL ENGINEERING**

**B. Tech (CSE-AIML) III Semester**

$\frac{L}{3}$	$\frac{T}{0}$	$\frac{P}{0}$	$\frac{C}{3}$
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**UNIT-1**

**DC Circuits:** Circuit Concept–R-L-C parameters–Voltage and Current sources Ohm’s law ,Kirchhoff’s laws, types of sources, source transformations, V-I relation for passive elements ,series parallel circuits, star- delta and delta –star transformations, mesh and nodal analysis, network theorems –super position, thevenin’s, maximum power transfer theorem, simple problems.

**UNIT-2**

**AC Circuits:** Representation of sinusoidal waveforms, waveforms and basic definitions, RMS and Average values of the alternating quantity, form factor and peak factor, phasor representation of alternating quantities, the ‘j’ operator and phasor algebra, Analysis of AC circuits with single basic network elements. Single phase series circuits. Three phase circuits – phase sequence, star and delta connection, relation between line and phase voltage and currents in a balanced system.

**UNIT-3**

**DC Machines:**

DC Generators -Principle and operation, constructional details, types, EMF equation, DC Motor- Principle and operation, Principle and operation, types, Torque equation, Losses and Efficiency in DC Generators and Motors, Speed control of DC Motors

**UNIT-4**

**Transformer:**

Single phase transformer-Principle and operation, construction details, Ideal transformer and practical transformer, equivalent circuit, losses, OC and SC Test, Efficiency and Regulation, simple problems. Three phase transformer-Classification.

**UNIT-5**

**AC Machines:**

Three phase induction Motor: Generation of rotating magnetic field, Principle and operation, constructional details, types, Concept of slip, significance of torque slip

characteristic, problemson slip, rotor frequency, rotor EMF and Torque. Principle and operation of Alternator, Singlephase induction motors – Classification.

**TEXT BOOKS:**

1. Basic concepts of Electrical Engineering, PS Subramanyam, BS Publications.
2. Basic Electrical Engineering, S.N. Singh, PHI.

**REFERENCE BOOKS:**

1. Basic Electrical Engineering, Abhijit Chakrabarthi, Sudiptanath, Chandrakumar Chanda, Tata-McGraw- Hill.
2. Principles of Electrical Engineering, V. K Mehta, Rohit Mehta, S. Chand Publications.
3. Basic Electrical Engineering, T.K. Nagasarkar and M.S. Sukhija, Oxford University Press.
4. Fundamentals of Electrical Engineering, RajendraPrasad, PHI.
5. Basic Electrical Engineering by D.P. Kothari, I.J. Nagrath, McGraw-Hill.

**Course Outcomes**

On completion of the course, students will be able to

1. Apply Kirchoff 's Laws & network reduction techniques.
2. Explain AC fundamentals of single & three phase circuits,
3. Categorize DC machines, operation and its characteristics, with the help of tests and speed control methods.
4. Acquire the knowledge of operation and performance Analysis of transformers
5. Analyze three phase induction motor operation with their characteristics & acquire the knowledge of alternators and single-phase Induction motors.

**\*\*END\*\***

**(A30229) BASIC ELECTRICAL ENGINEERING LAB**

**B. Tech (CSE-AIIML) III Semester**

$\frac{L}{0}$	$\frac{T}{0}$	$\frac{P}{3}$	$\frac{C}{1.5}$
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**PART A:**

1. Verification of KCL and KVL.
2. Verification of Superposition theorem
3. Verification of Maximum power transfer theorem.
4. Verification of Thevenin 's theorem.
5. Time Response of First Order RC/RL Network for periodic, non-sinusoidal inputs-timeconstant and steady state error determination

**PART B:**

1. Magnetization characteristics of D.C. Shunt generator.
2. Speed control of DC motor.
3. Swinburne 's Test on DC shunt machine.
4. Brake test on DC shunt motor.
5. OC and SC tests on Single-phase transformer.
6. Brake test on 3-phase Induction motor.
7. Load Test on single phase Transformer

**Note: Any 10 of the above experiments are to be conducted.**

**Course Outcomes**

On Completion of the course, students will be able to

1. Verify KCL & KVL.
2. Verify different theorems.
3. Analyze time response of RC/RL networks.
4. Acquire the knowledge of different tests conducted on DC machines
5. Acquire the knowledge of performance of single-phase transformers and Three Phase Induction Motors

**\*\*END\*\***

**(A36202) JAVA LAB**  
**(Common to CSE-CS, CSE-AI&ML)**

**B. Tech (CSE-AIML) III Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	3	1.5

**Week 1:**

1. Write a java program that works as a simple calculator for the +,-,\*,/,% operations using classes and objects in java.
2. Write a java program to find result of a given arithmetic expression?  
(EX: if you given arithmetic expression like  $10+20-24*4/2-4.5=$  it should print 7.5)

**Week 2:**

3. Write a program to demonstrate the following
  - i) Super, Final ii) Single inheritance iii) Multi –level inheritance
4. Write a program to demonstrate the usage of method overriding, calling super class constructor in derived class.

**Week 3:**

5. Write a java program to create an abstract class named **shape** that contains two integers and an empty method named printarea (). Provide three classes named Rectangle, Triangle and Circle such that each one of these classes extends the class Shape. Each one of the classes contains only the method printarea () that prints the area of the given shape.

**Week 4:**

6. Write a program to demonstrate method overloading and constructor overloading.
7. Write a program to demonstrate polymorphism using interface (interface in package P1 and class in package P2)

**Week 5: Exception handling in java**

8. Implement pre-defined exceptions
9. Implement user defined exceptions

**Week 6:**

10. Develop a scala and swing component in java that displays a simple message.

11. Write a java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, num1 and Num2. The division of Num1 and Num2 is displayed in the result fields when the division button is clicked. If Num1 or Num2 were not an integer, the program should throw a Number Format Exception. If Num2 were Zero the program should throw an Arithmetic Exception. Display the exception in a message dialog box.

**Week 7:**

12. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second. if the generated value is even, second thread computes the square of the number and prints. If the generated value is odd, the third thread will print the value of cube of the number

**Week 8:**

13. Write a java program to demonstrate Generic class and generic methods

14. Write a java to perform string operations using sting buffer class and its methods.

**Week 9:**

15. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with —Stop! or —ready! or —Go! should appear above the buttons in selected color initially, there is no message shown.

**Week 10:**

16. Write a java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab(\t). it takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).

**Week 11:**

17. Write a java program that connects to a data base using JDBC and does add, delete, modify and retrieve operations.

**Week12**

18. Implement the week 10 program with database instead of a text file.

19. Write a java program that takes tab separated data (one record per line) from a text file and inserts them into a database.

### **Textbooks**

1. Java Fundamentals- A Comprehensive introduction, Herbert schildt and Dale skrien, TMH.
2. Programming Development in Java, Barbara Liskov, Addison-Wesley

### **References**

1. Java for programming, P.J. Dietel Pearson education (OR) Java: How to Program P.J. Dietel and H.M. Dietel, PHI
2. Data Abstraction and Problem Solving with Java: Walls and Mirrors by Frank M. Carrano and Janet J. Prichard
3. Object Oriented Programming through java, P. Radha Krishna, Universities Press.
4. Thinking in Java, Bruce Eckel, Pearson Education
5. Programming in Java, S. Malhotra and S. Choudhary, Oxford University Press

### **Course Outcomes**

#### **On completion of the course students will be able to**

1. Write & execute programs using JAVA Programming Language Syntax
2. Use Java API functions to write and execute programs for problem solving.
3. Demonstrate the usage of Java Exception handling mechanisms.
4. Write and execute Java applications using Java String Buffer Class
5. Design Java Applications using JAVA GUI components and test them by execution.

**\*\*END\*\***

**(A30021) SOCIAL INNOVATION IN PRACTICE**

**(Common for all branches)**

**B. Tech (CSE-AI ML) III Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**UNIT 1**

Identify community issues to be addressed, Requirements Analysis: Extensive User requirements analysis, Generating effective System Requirement document.

**UNIT 2**

Social Innovation – Case Studies

Presentation of the case studies with a focus on impact and vision on society.

**UNIT 3**

Process of Social Innovation

Prompts – identifying needs, Proposals – generating ideas, Prototyping – testing the idea in practice,

**UNIT 4**

Sustaining-developing a business model, Scaling and diffusion-growing social innovations, Systematic change.

**UNIT 5**

Report writing, Documentation and Panel presentation

**Reference Books:**

1. Requirements Analysis: From Business Views to Architecture; David C. Hay; Prentice Hall Professional
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, Yeheskel Hasenfeld; Palgrave Macmillan
3. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean



**Course Outcomes:**

**On Completion of the course, the students will be able to**

1. Identify several social issues to be addressed
2. Analyse the impact of social innovations on the society
3. Analyze the process of social innovation for a community problem
4. Develop a scalable business model.
5. Analyse the feasibility and economical factors

**\*\*END\*\***

**(A30015) SOFT SKILLS & PROFESSIONAL ETHICS**  
**(Mandatory Course)**

**B. Tech (CSE-AIML) III Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	2	0

**UNIT-I:**

**Business Communication Skills:**

English Language Enhancement the Art of Communication.

**UNIT-II:**

**Intrapersonal & Interpersonal Relationship Skills:**

- Intrapersonal Relationships
- Interpersonal Relationships – To be an Effective Team Player

**UNIT-III:**

**Campus to Company:**

- Corporate Dressing
- Corporate Grooming
- Business Etiquette
- Communication Media Etiquette

**UNIT-IV:**

**Group Discussions, Interviews and Presentations:**

- Group Discussions
- Interviews
- Presentations

**UNIT-V:**

**Entrepreneurial Skills Development:**

- Goal Setting
- Entrepreneurial Skills – Awareness and Development

**REFERENCES**

1. UNLEASH the power within Soft Skills – Training Manual (Infosys Campus Connect)

### **Course Outcomes**

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

1. Express themselves with proper pronunciations and sentence construction
2. Demonstrate a strong teamwork and be a team player
3. Develop a strong personal etiquette
4. Demonstrate good leadership qualities
5. Recognize and identify basic English grammar

**\*\*END\*\***

(A36601) MACHINE LEARNING

B. Tech (CSE-AI&ML) IV Semester

$\frac{L}{3}$	$\frac{T}{1}$	$\frac{P}{0}$	$\frac{C}{4}$
---------------	---------------	---------------	---------------

**Unit 1:**

**Introduction:** What is machine learning, Examples of machine learning applications: learning association, classification, regression, unsupervised learning, reinforcement learning.

Supervised Learning: Learning a class from examples, Vapnik-Chervonekis (VC) dimension, Noise, Learning multiple classes, regression, Model selection and Generalization, Dimensions of supervised machine learning algorithm.

**Unit-2**

**Bayesian Decision Theory:** Introduction, classification, Losses and Risks, Discriminant Functions, Utility Theory, Association Rules.

**Parametric Methods:** Introduction, Maximum Likelihood Estimation, Evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, k-NN, SVM, Regression, Tuning Model complexity: Bias/variance Dilemma, Model Selection Procedures.

**Unit-3**

**Dimensionality Reduction:** Introduction, Subset Selection, Principle Component Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant analysis.

**Clustering:** Introduction, Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models. Supervised Learning after Clustering, Hierarchical Clustering. Choosing the Number of Clusters.

**Unit-4**

**Decision Trees:** Introduction, Univariate Trees: Classification, Regression, Pruning, Learning Rules from Data, Multivariate Trees.

**Linear Discrimination:** Introduction, Generalizing the linear model, geometry of the linear discriminant, pairwise separation, Parametric discrimination, Gradient Descent, Logistic Discrimination, Discrimination by regression.

### **Unit-5**

**Multilayer Perceptron:** Introduction, Perceptron, training a perceptron, Learning Boolean Functions, Multilayer perceptron's, MLP as a universal approximator, Backpropagation algorithm, training procedures.

**Combining Multiple Learners:** Bagging, Boosting.

### **Text Books:**

1. Ethem Alpaydın, Introduction to Machine Learning, Second Edition, The MIT Press

### **Reference Books:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

### **Course Outcomes**

After studying this course, students will be able to

- 1.Explain the supervised learning techniques
2. Use Bayesian decision theorem &parametrice methods on various ML applications
3. Solve higher dimension problems in the data and use of non supervised learning techniques
4. Apply decision tree on various ML applications and use of discriminant analysis
- 5 Interpret the neural networks and its techniques.

\*\*\*END\*\*

**(A30511) DESIGN AND ANALYSIS OF ALGORITHMS**

**B.Tech (CSE-AIIML) IV Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	1	0	4

**Unit-I**

Introduction: Characteristics of algorithm, Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

**Unit-II**

Fundamental Algorithmic Strategies – I: Divide and Conquer, Greedy, and Dynamic Programming, methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Strassen's Matrix Multiplication, Bin Packing, job sequencing with deadlines, Huffman codes, Knapsack, OBST, Matrix chain multiplication, TSP.

**Unit-III**

Fundamental Algorithmic Strategies – II: Branch and Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, N-Queens, 0/1 Knapsack, TSP, Sum of sub sets, Graph coloring, Hamiltonian cycle.

**Unit-IV**

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

**Unit-V**

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Game tree, min-max search Standard NP-complete problems and Reduction techniques.

**Text books:**

1. Fundamentals of Algorithms – E. Horowitz et al.
2. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.

**Reference books:**

1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
3. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

**Course Outcomes**

**On completion of the course students will be able to**

1. Explain various asymptotic notations to measures the performance of an algorithm
2. Discuss algorithms design strategies
3. Apply Graph & Tree algorithms for real world applications
4. Describe various computability Classes
5. Illustrate P & NP –Type Problems

**\*\*END\*\***

**(A30516) OPERATING SYSTEMS**

**B. Tech (CSE-AIML) IV Semester**

**$\frac{L}{3}$     $\frac{T}{0}$     $\frac{P}{0}$     $\frac{C}{3}$**

**UNIT-I**

Operating System Introduction, Structures - Simple Batch, Multi-programmed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls.

**UNIT –II**

**Process and CPU Scheduling-** Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.

System call interface for process management-fork, exit, wait, waitpid, exec

**UNIT –III**

**Deadlocks** - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

**Process Management and Synchronization-** The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors. Inter process Communication Mechanisms: IPC between processes on a single computer system, IPC

between processes on different systems, using pipes, FIFOs, message queues, shared memory.

**UNIT –IV**

**Memory Management and Virtual Memory-** Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

**UNIT -V**

**File System Interface and Operations-**Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. usage of open, create, read, write, close, lseek, stat, ioctl, system calls



**Text Books:**

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R. Stevens, Pearson education.

**Reference Books:**

1. Operating Systems – Internals and Design Principles, Stallings, 5th Edition, Pearson Education/PHI, 2005.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 2nd edition, Pearson/PHI.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Unix Internals the New Frontiers, U. Vahalia, Pearson Education.

**Course Outcomes**

Students shall be able to

1. Describe the components of computer and their respective roles in computing.
2. Explain process concepts and CPU Scheduling Algorithms
3. Demonstrate the Mutual exclusion, deadlock detection and Inter Process Communications.
4. Analyze various memory management and allocation methods.
5. Discuss File System Interface and Operations.

**\*\*END\*\***

(A30509) DATABASE MANAGEMENT SYSTEMS

B. Tech (CSE-AI ML) IV Semester

$\frac{L}{3}$	$\frac{T}{1}$	$\frac{P}{0}$	$\frac{C}{4}$
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**Unit-1:**

**Database System Applications:** Database system vs file system, view of data, data abstraction, instances and schemas, data models, the ER model, relational model, other models, database languages, DDL, DML, database users and administrator, transaction management, database system structure, storage manager, the query processor, data base design and ER diagrams, beyond ER design entities, attributes and entity sets, relationships and relationship sets, additional features of ER model, concept design with the ER Model

**Unit-2:**

**Introduction to the Relational Model:** Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying, altering tables and views.

Form of basic SQL query, examples of basic SQL queries, introduction to nested queries, correlated nested queries, set comparison operators, aggregation operators, NULL values, comparison using null values, logical connectivity's, AND, OR and NOT, impact on SQL constructs, outer joins, disallowing NULL values

**Unit-3:**

**Relational Algebra:** Selection and projection, set operations, renaming, Joins, Division, Examples of Algebra overviews, Relational calculus, Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus. Schema refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, dependency preserving decomposition, schema refinement in database design, multi valued dependencies, FOURTH normal form, FIFTH normal form.

**Unit-4:**

**Transactions:** Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity.

**Unit-5:**

**Storage:** Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

**Text Books:**

- 1.“Database System Concepts”, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
- 2.” Database Management Systems”, 3<sup>rd</sup> Edition by Johannes Gehrke and Raghu Ramakrishnan, McGraw-Hill.

**Reference Books:**

- 1 “Principles of Database and Knowledge – Base Systems”, Vol 1 by J. D. Ullman, Computer Science press.
- 2 “Fundamentals of Database Systems”, 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
- 3 “Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

**Course Outcomes**

**On completion of the course students will be able to**

1. Explain the significance of Database Management Systems.
2. Write SQL queries to interact with RDBMs
3. Describe various Normal Forms of Relations.
4. Evaluate various concurrency control protocols
5. Classify Indexing Techniques based on prime attributes.

**\*\*END\*\***

**(A30510) DATABASE MANAGEMENT SYSTEMS LAB**

**B. Tech (CSE-AIML) IV Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	3	1.5

**Week-1: Working with DDL, DML, DCL and Key Constraints**

(Creation, Altering and Dropping of Tables and Inserting Rows into a Table (Use Constraints While Creating Tables) Examples Using Select Command.)

**Week-2: Working with Queries and Nested QUERIES**

(Queries (along with sub-Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints)

**Week-3: Working with Queries USING Aggregate Operators & views**

Queries using Aggregate Functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and Dropping of Views

**Week-4: Working with Conversion Functions & String Functions**

Queries using Conversion Functions (to\_char, to\_number and to\_date), String Functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), Date Functions (Sysdate, next\_day, add\_months, last\_day, months\_between, least, greatest, trunc, round, to\_char, to\_date)

**Week-5: Working with Triggers using PL/SQL**

Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

**Week-6: Working with PL/SQL Procedures**

Programs Development using Creation of Procedures, Passing Parameters IN and OUT of PROCEDURES.

**Week-7: Working with LOOPS using PL/SQL and Exception Handling**

Program Development using WHILE LOOPS, Numeric FOR LOOPS, Nested Loops using ERROR Handling, BUILT-IN Exceptions, USE Defined Exceptions, RAISE- APPLICATION ERROR

**Week-8: Working with Functions Using PL/SQL**

Program Development using Creation of Stored Functions, Invoke Functions in SQL Statements and Write Complex Function

**Week-9: Working with CURSORS**

Develop Programs using Features Parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of Clause and CURSOR Variables

**Week-10: Working with PL/SQL Packages**

Program development using Packages.

**Week-11: Case Study-I**

Design & Implementation of Library Management System

**Week-12: Case Study-II**

Design & Implementation of Hospital Management System

**Reference books:**

1. Oracle PL/SQL by Example, Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
2. Oracle Database LogG PL/SQL Programming, Scott Urman, Tata Mc-Graw Hill.
3. SQL and PL/SQL for Oracle 10g, Black Book, Dr .P.S. Deshpande.

**Course Outcomes**

**On completion of the course students will be able to**

1. Demonstrate the usage of SQL statements for the creation, manipulation of data in the Database.
2. Write & execute queries on the given Database
3. Write & Execute PL/SQL programs for a given application
4. Develop & Demonstrate the usage of Cursors in PL/SQL
5. Design & Implement a given Enterprise Database

**\*\*END\*\***

**(A36602) MACHINE LEARNING LAB**

**B.Tech (CSE-AI&ML) IV Sem**

L	T	P	C
0	0	4	2

***LAB EXPERIMENTS***

*Note: Use Open-Source Software Tools, Programming Languages (Java, Python.R. etc) to perform the experiments or to implement the Machine Learning Algorithms.*

1. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
2. Write a program to demonstrate the working of the decision tree algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
4. Write a program to implement Support Vector Machine algorithm to classify the iris data set. Print both correct and wrong predictions.
5. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
6. Apply Hierarchical Clustering algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
8. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
9. Write a program to implement AdaBoost algorithm to classify the iris data set. Print both correct and wrong predictions.
10. Perform model aggregation on MNIST digit dataset.

**Text Books:**

1. Ethem Alpaydm, Introduction to Machine Learning, Second Edition, The MIT Press

**Reference Books:**

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
2. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

**Course Outcomes**

**The student will be able to**

1. Develop machine learning models on point data using Naïve bayes, SVM, decision tree, and  $k$ -NN.
2. Compare and contrast the EM and k-Means clustering algorithm
3. Construct the ML models using hierarchical clustering.
4. Develop neural networks and apply back propagation
5. Develop ensemble techniques for the prediction of problem.

**\*\*END\*\***

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(A30517) OPERATING SYSTEMS LAB

B. Tech (CSE-AIML) IV Semester

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	3	1.5

**List of Experiments**

**Week 1:** Simulate the following CPU Scheduling Algorithms

a). FCFS b). SJF c). Priority d). Round Robin

**Week 2:** Simulate Banker's Algorithm for Deadlock Avoidance.

**Week 3:** Simulate Memory Management Technique.

a) Paging b) Segmentation

**Week 4:** Simulate the following Page Replacement Algorithms

a). FIFO b). LRU c). OPTIMAL

**Week 5:** Simulate the following File Allocation Strategies

a). Sequential b). Indexed c). Linked

**Week 6:** Simulate the following disk scheduling algorithms

a). SCAN b). CSCAN c). SSTF

**Week 7:** Write a C program to simulate the following contiguous memory allocation techniques

a). First-fit b) Best-fit c) Worst-fit

**Week 8:** Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)

**Week 9:**

a) Write a C program to simulate producer-consumer problem using semaphores.

b) Write a C program to simulate the concept of Dining-Philosophers problem

**Week 10:** Write C programs to illustrate the following IPC mechanisms

a) Pipes b) FIFOs c) Message Queues d) SharedMemory



**Text Books:**

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R. Stevens, Pearson education.

**Reference Books:**

1. Operating Systems – Internals and Design Principles, Stallings, 5th Edition, Pearson Education/PHI, 2005.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 2nd edition, Pearson/PHI.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Unix Internals the New Frontiers, U. Vahalia, Pearson Education.

**Course outcomes:**

**Students shall be able to**

1. Implement CPU Scheduling Algorithms
2. Implement deadlock avoidance algorithms
3. Implement various memory management algorithms
4. Implement various file management techniques
5. Demonstrate Inter-process communication

**\*\*END\*\***

**(A30016) GENDER SENSITIZATION**

**B. Tech (CSE-AIML) IV Semester**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
<u>0</u>	<u>0</u>	<u>2</u>	<u>0</u>

**UNIT-I:**

**Understanding Gender**

Lesson 1 – Gender: Why should we study it?

Lesson 2 – Socialization: Making Women, Making Men

Lesson 12 – Just Relationships: Being together as Equals

**UNIT-II:**

**Gender and Biology**

Lesson 4 – Missing Women: Sex selection and its consequences

Lesson 10 – Gender Spectrum: Beyond the Binary

Lesson 13 – Additional Reading: Our Bodies, Our Health

**UNIT-III:**

**Gender and Labour**

Lesson 3 – Housework: The Invisible Labour

Lesson 7 – Women’s Work: Its Politics and Economics

**UNIT-IV:**

**Issues of Violence**

Lesson 6 – Sexual Harassment: Say No!

Lesson 8 – Domestic Violence: Speaking Out

Lesson 11 – Thinking about Sexual Violence

**UNIT-V:**

**Gender Studies**

Lesson 5 – Knowledge: Through the Lens of Gender

Lesson 9 – Who’s History? Questions for Historians and Others.

## **COURSE OUTCOMES**

### **Students shall be able to**

1. Identify realities of gender discrimination prevalent in the society at all levels.
2. Infer and discuss historical evidences, perspective and voices of discrimination against women in all societies and civilizations.
3. Identify, protest and overcome the evils of body shaming.
4. Analyze discrimination and exploitation of women labour in domestic as well as social sphere. Learners infer women's rights, women's wage disparities, women's issues and demonstrate these grievances through law.
5. Identify different types of sexual exploitation; sexual violence and marital violence show empathy towards victims of such violence and generate public opinion in face of any exploitation

**\*\*END\*\***

**(A36603) ARTIFICIAL INTELLIGENCE**

**B. Tech CSE (AI & ML) V SEM**

**$\frac{L}{3}$     $\frac{T}{0}$     $\frac{P}{0}$     $\frac{C}{3}$**

**UNIT I:**

**Introduction:** Definition of AI, History of AI, nature of AI problems, examples of AI problems. Current trends in Artificial Intelligence. Intelligent Agents, different types of agents.

**Problem solving by search:** Uninformed Search: Depth First Search (DFS), Breadth First Search (BFS). Informed Search: Best First Search, A\*. Local Search: Hill Climbing. Problem Reduction Search: AO\*. Population Based Search: Ant Colony Optimization, Genetic Algorithm. Adversarial Search: Game Playing-Min Max Algorithm, Alpha-Beta Pruning.

**UNIT II :**

**Knowledge Representation:** Types of Knowledge, Knowledge Representation Techniques/schemes: Propositional Logic, syntax, semantics, inference, Predicate Logic, Semantic nets, Frames. Knowledge representation issues. Rule based systems.

**UNIT III :**

**Reasoning under Uncertainty:** Basics of Probability Theory, Probabilistic Reasoning, Bayesian Reasoning, Dempster-Shafer Theory. Planning: Introduction to Planning, Representation of Planning, Partial-order Planning.

**UNIT IV :**

**Learning:** Introduction to Learning, Types of Learning: Learning by Induction, Rote Learning, Symbol Based Learning, Identification Trees, Explanation Based Learning, Transformational Analogy,

**UNIT V :**

**Natural Language Processing:** Language Models, Text classification, Information Retrieval, information extraction

**Expert System and Applications:** Introduction, Phases in Building Expert Systems, Expert System Architecture Stages in the development of an Expert Systems, Difficulties in Developing Expert Systems-Applications of Expert Systems

**TEXT BOOKS:**

1. Artificial Intelligence: A Modern Approach Third Edition Stuart Russell and Peter Norvig, 2010, Pearson Education.

**REFERENCE BOOKS:**

- 1.Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed.,2009.
- 2.Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010.
- 3.Artificial intelligence, Patrick Henry Winston, 1992, Addison We

**Course Outcomes**

**After undergoing this course, the students will be able to:**

1. Display the understanding of the historical perspective of AI and its foundation.
2. Apply basic principles of AI in solutions that require problem solving, inference, knowledge representation and learning.
3. Demonstrate fundamental understanding of various application of AI techniques in Expert systems, Neural Networks.
4. Demonstrate an ability to share in discussion of AI, it's the current trends, limitations, and implications of AI.
5. Explain the natural language processing and Expert system applications.

**\*\*END\*\***

(A30525) SOFTWARE ENGINEERING

B.Tech CSE(AI&ML) V SEM

$\frac{L}{3}$     $\frac{T}{0}$     $\frac{P}{0}$     $\frac{C}{3}$

**UNIT I :**

**Introduction to Software Engineering:** The evolving role of software, changing nature of software, A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, Process models: The waterfall model, incremental process models, evolutionary process models, the unified process. Agile process, Agile process models.

**UNITII :**

**Software Requirements:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. System models: Context models, behavioral models, data models, object models, structured methods

**UNITIII :**

**Design Engineering:** Design process and design quality, design concepts, the design model, Architectural Design Styles and patterns. Conceptual model of UML, basic structural modeling, use case diagrams, class diagrams, sequence diagrams, collaboration diagrams, component diagram

**UNIT-IV :**

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

**UNIV :**

**Estimation:** observations on estimation, the project planning process, Empirical estimation models. Risk management: Reactive Vs proactive risk strategies, Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, Change Management: software configuration management, The SCM Repository, The SCM Process.

**Text Books:**

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2. Software Engineering-Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

**References:**

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education

**Course Outcomes**

**On completion of the course students will be able to**

1. Identify the need to engineer a software system
2. Choose appropriate process model to develop a software system
3. Analyze customer requirements and prepare Software Requirement Specification (SRS)
4. Design software system for the given SRS using appropriate design methodology
5. Perform test planning and test execution for a given system using relevant techniques

**\*\*END\*\***

(A30514) COMPUTER NETWORKS

B.Tech CSE(AI&ML) V SEM

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

Semester

UNIT -I

**Introduction:** Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

**Physical Layer:** Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

UNIT –II

**Data link layer:** Design issues, framing, Error detection and correction.

**Elementary data link protocols:** simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

**Sliding Window protocols:** A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.

**Medium Access sub layer:** The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT –III

**Network Layer:** Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT –IV

**Transport Layer:** Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT -V

**Application Layer** –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.



**Text Books:**

1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

**Reference Books:**

1. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. 3rdEdition, TMH.

**Course Outcomes:**

The student shall be able

1. Describe the functions of each layer in OSI and TCP/IP model and explain the types of transmission media with real time applications
2. Describe the functions of data link layer and explain the protocols
3. Classify the routing protocols and analyze how to assign the IP addresses for the given network
4. Describe the Transport layer services.
5. Explain the functions of Application layer Protocols.

**\*\*END\*\***

**(A36605) THEORY OF COMPUTATION****B.Tech CSE(AI&ML) V Sem**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT -I**

**Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

**Nondeterministic Finite Automata:** Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

**Deterministic Finite Automata:** Definition of DFA, How a DFA processes strings, The language of DFA, Conversion of NFA with  $\epsilon$ -transitions to NFA without  $\epsilon$ -transitions. Conversion of NFA to DFA, Moore and Mealy machines

**UNIT –II**

**Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

**Pumping Lemma for Regular Languages,** Statement of the pumping lemma, Applications of the Pumping Lemma.

**Closure Properties of Regular Languages:** Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

**UNIT –III**

**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

**Push Down Automata:** Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

**UNIT –IV**

**Normal Forms for Context-Free Grammars:** Eliminating useless symbols, Eliminating  $\epsilon$ -Productions. Chomsky Normal form, Greibach Normal form.

**Pumping Lemma for Context-Free Languages:** Statement of pumping lemma, Applications.

**Closure Properties of Context-Free Languages:** Closure properties of CFL's, Decision Properties of CFL's.

**Turing Machines:** Introduction to Turing Machine, Formal Description.

Instantaneous description, The language of a Turing machine.

## **UNIT -V**

**Types of Turing machine:** Turing machines and halting machines

**Undecidability:** Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

### **TextBooks:**

1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra And Chandrashekar, 2nd Edition, PHI.

### **Reference Books:**

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.

### **Course Outcomes**

The student shall be able to:

1. Explain the concept of abstract machines and their power to recognize the languages.
2. Employ finite state machines for modeling and solving computing problems.
3. Design context free grammars for formal languages.
4. Distinguish between decidability and undecidability.
5. Gain proficiency with mathematical tools and formal methods

**\*\*END\*\***

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**(A36606) COMPUTER VISION**

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**B.Tech CSE(AI&ML) V SEM**

$\frac{L}{3}$	$\frac{T}{0}$	$\frac{P}{0}$	$\frac{C}{3}$
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**UNIT-I****Introduction to Computer Vision and Basic Concepts of Image Formation:**

Introduction and Goals of Computer Vision and Image Processing. Image Formation Concepts.

**Fundamentals of Image Formation:** Radiometry, Geometric Transformations, Geometric Camera Models. Camera Calibration, Image Formation in a Stereo Vision Setup, Image Reconstruction from a Series of Projections.

**UNIT-II**

**Image Processing Concepts:** Sampling and Quantization, Image Enhancement: Intensity transformations, contrast stretching, histogram equalization, Spatial filtering: Smoothing filters, sharpening filters, Frequency domain filtering,

**Color Image Processing:** Color Fundamentals and Color models-The RGB Color Model, The CMY and CMYK Color Models.

**UNIT-III**

**Morphological Image Processing:** Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transformation, Basic Morphological Algorithms: Hole filling, connected components, Thinning and skeletons.

**Image Segmentation:**

Edge detection, thresholding, Region growing, segmentation by clustering, Watershed algorithm, Active contour models, Texture feature based segmentation

**UNIT-IV****Feature Extraction:**

First and second order edge detection operators, Localized feature Extraction, detecting Image curvature, shape features, Describing Neighborhood using SIFT and HOG features, Introduction to Hough Transform, shape skeletonization, Boundary

**Object Tracking:** Exhaustive vs. Stochastic Search, Shapes, Contours, and Appearance Models. Mean-shift tracking; Contour-based models descriptors, Moments, Texture descriptors.

## UNIT-V

### Object Modeling & Detection:

Fundamental matrix / Epipolar geometry , Adaboost approaches: Face Detection / Recognition Large Datasets; Attention models. Applications: physical rehabilitation and training, human-machine interaction, Surveillance, Object detection, etc.

### Text Books:

1. David Forsyth and Jean Ponce, Computer Vision: A modern Approach, Prentice Hall India 2004:
2. “Digital Image Processing”, Rafael C. Gonzalez, Richard E. Woods, et al, TMH , 2nd Edition 2010

### Text Books:

3. David Forsyth and Jean Ponce, Computer Vision: A modern Approach, Prentice Hall India 2004:
4. “Digital Image Processing”, Rafael C. Gonzalez, Richard E. Woods, et al, TMH , 2nd Edition 2010

### Reference Books:

1. E.R. Davies, Machine Vision, Theory Algorithms Practicalities, Elsevier 2005
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis, and Machine Vision. Brooks/Cole / Thomson 1999
3. Russell and Norvig: AI: A modern Approach, Prentice Hall 2000.

### Course Outcomes

Students shall be able to

1. Explain Sampling, Quantization, techniques
2. Discuss Sampling and Quantization, Image Enhancement
3. Discuss image segmentation and image morphology
4. Describe feature Extraction and perform object tracking.
5. Perform Object modeling & detection .

\*\*\*End\*\*\*

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**(A36604) ARTIFICIAL INTELLIGENCE**

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**B. Tech CSE (AI&ML) V SEM**

$\frac{L}{0}$	$\frac{T}{0}$	$\frac{P}{3}$	$\frac{C}{1.5}$
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List of programs:

1. Write a Program to find the solution for travelling salesman Problem.
2. Write a Program to Implement Hill-climbing for sloving 8-Puzzle problem using Python.
3. Write a Program to Implement Tic-Tac-Toe game using Python.
4. Write a Program to Implement Water-Jug problem using Python.
5. Write a program to implement A\* and AO\* Algorithm.
6. Write a program to find the solution for wampus world problem.
7. Write a Program to Implement Monkey Banana Problem.
8. Write a Program to Implement Missionaries-Cannibals Problems using Python.
9. Write a Program to implement simple map coloring problem using CSP
10. Apply the Bayes' rule to a problem of drug screening using the following case study  
Suppose that a test for using a particular drug is **97% sensitive** and **95% specific**. That is, the test will produce **97% true positive** results for drug users and **95% true negative results** for non-drug users. These are the pieces of data that any screening test will have from their history of tests. Calculate the final probability Bayes' rule.
11. Write a program to implement speech conversion into English text.
12. Write a program to implement Expert System with forward chaining.
13. Write a program to implement Expert System with backward chaining.
14. Write a program for simple chatbot for college information enquiries.

**TEXTBOOK:**

1. Artificial Intelligence: A Modern Approach Third Edition Stuart Russell and Peter Norvig, 2010, Pearson Education.

**REFERENCE BOOKS:**

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed., 2009.
2. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI., 2010.
3. Artificial intelligence, Patrick Henry Winston, 1992,

**Course Outcomes:**

After completion of the course, students will be able to

1. Implement basic AI algorithms.
2. Implement and apply AI techniques for problem solving using various search and game playing algorithms.
3. Recognize basics of speech conversion.
4. Interpret architectures and working of different Expert Systems.
5. Explain functionality of Chat-Bot

**\*\*END\*\***

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**(A36607) COMPUTER VISION LAB**

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**B.Tech CSE(AI&ML) V SEM**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	3	1.5

**LAB EXPERIMENTS**

Note: Use any tool like OpenCV/ Scilab

- Write programs for the following
  - Loading and displaying an image.
  - Reading and writing video files.
  - Image enhancement.
- Write a code for basic Statistical Analysis of Images(To find sum , average , standard deviation , min and max)
- Write a program study contrast adjustment of a given image
- Write a code to apply Different Filtering Operations on Images.
- Write a code to apply morphological operations like dilation, erosion, opening and closing on the given image.
- Write a code for detection of an edge / curvature in a given image and curve fitting
- Write a code to implement SURF / SIFT / HOG detector
- Implement histogram calculation and equalization for the given image.
- Write a code to perform 2-D spatial transformation to image
- Convert the input image from RGB color space to CMY and HSV color space.
- Write a code for feature Extraction from Images.
- Write a code for basic Shape Analysis of an image.
- Write a program to reduce dimensionality using PCA for the given images.
- Write a code for object detection using Hough transform / Template matching.
- Object classification using SVM / Adaboost classifier .
- Object tracking using Kalman filter approach.
- Face Detection Algorithm Implementation.

**Text Books:**

- David Forsyth and Jean Ponce, Computer Vision: A modern Approach, Prentice Hall India 2004:
- Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2008

**Reference Books:**

- E.R. Davies, Machine Vision, Theory Algorithms Practicalities, Elsevier 2005
- Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis, and Machine Vision. Brooks/Cole / Thomson 1999
- Russell and Norvig: AI: A modern Approach, Prentice Hall 2000.



4. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Cambridge Univ Press 2000

**Course Outcomes:**

After completion of the course, students will be able to

1. Understand fundamental image processing techniques required for computer vision.
2. Employ various image enhancement and edge detection techniques.
3. Extract features using Histogram Processing, Color.
4. Apply basic segmentation, morphological operations and Hough transformation.
5. Evaluate various pattern classification techniques.

**\*\*END\*\***

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**(A30014) ENVIRONMENTAL SCIENCES  
(MANDATORY COURSE)**

**B. Tech. CSE(AI&ML) V-Semester**

L	T	P	C
2	0	0	0

**UNIT-I**

**Environmental Studies:**

Introduction, Definition, scope and importance, Ecosystems: Introduction, types, characteristic features, structure and functions of ecosystems. Bio geo chemical cycle, Classification of Eco system.

**UNIT-II**

Natural Resources: Classification of Resources, Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer –pesticide problems, Forest resources, Use and over-exploitation. Mining and dams – their effects on forest and tribal people, Water resources, Use and over-utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Dams – benefits and costs, Conflicts over Water, Energy resources.

**UNIT-III**

Bio-diversity and its conservation, Value of bio-diversity -consumptive and productive use, social, ethical, aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity – Insitu and Ex-situ conservation.

**UNIT-IV**

Environmental Pollution –Local and Global Issues, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion. Environmental case studies.

**UNIT-V**

Environmental Problems in India, Drinking water, sanitation and public health, Effects of the activities on the quality of environment, Water scarcity and groundwater depletion, Controversies on major dams – resettlement and rehabilitation of people: problems and concerns, Rain water harvesting, cloud seeding and watershed management. Economy and Environment, The economy

and environment interaction, Economics of development, preservation and conservation, Sustainability: theory and practices, Limits to growth, Equitable use of resources for sustainable life styles, Environmental Impact Assessment.

### **Text Books**

1. Environmental Science - Y. Anjaneyulu, B S Publications. 1<sup>st</sup> Edition
2. Environmental studies-Deekshadave, Cengage learning India Pvt. Ltd.,
3. Environmental sciences and Engineering - P. Venugopal Rao, PHI learning Pvt. Ltd.,
4. Environmental Science and Technology by M. Anji Reddy, B S Publications.

### **Reference Books**

1. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
2. Cunningham, W.P., et al. Environmental Encyclopedia, Jaico Publishing House, Mumbai, 2003.

### **Course Outcomes:**

students shall be able to

1. Acquire the knowledge on environment
2. Acquire the knowledge of various Natural Resources
3. Develop skills in understanding of various environmental problems
4. Develop skills to protect the Environment
5. To understand various environmental issues in India

**\*\*END\*\***

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**(A36608) Deep Learning**

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**B. Tech. CSE(AI&ML) VI-Sem**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT-I**

Introduction: History, AI vs ML vs DL, Deep Learning and its Applications, Prerequisites: Linear Algebra and Machine Learning – Revisited: Matrix types, derivative, transformation, inverse, determinants, statistics: mean, median, mode, probability: Bayes theorem, Eigen Decomposition, Singular Value Decomposition; conditional probability, the chain rule of conditional probability, expectation, variance and covariance, common probability distributions, baye's rule, overflow and underflow, Gradient-based optimization, constrained optimization

**UNIT-II**

Basics of Machine Learning: features, weights, Linear Regression, Logistic Regressions, loss function, cost function, Multilayer perceptron, forward propagation; Model Training: Backpropagation, Stochastic Gradient Descent and Optimizers: Momentum, RMSProp, Adam; Deep Learning Experiments: Datasets, training-validation testing set, evaluation measures: accuracy, precision, recall, f-measure.

**UNIT-III**

Model Improvement: Overfitting vs underfitting, Bias vs Variance, hyper parameter tuning: random, coarse to fine; Regularization: L1, L2 regularization, Dropout, Early stopping, Data normalization, Augmentation; Convolutional Neural Networks: convolution, striding, padding, pooling, 1x1 convolution, famous CNN models; CNN Applications: Transfer Learning, Image classification, face detection, object detection, face/instance recognition.

**UNIT-IV**

Recurrent Neural Networks: Time-series data analysis, forward propagation, Backpropagation Through Time (BPTT), word embedding, Vanishing-exploding gradients, LSTM, GRU; RNN Application: Sentiment analysis, text generation, image captioning, machine translation, attention model, speech recognition, video classification; Unsupervised Learning: Sparse Coding, Auto-encoder, Denoising Autoencoder; AE Applications: Data compression, retrieval, classification, document clustering, sentiment analysis.

**UNIT-V**

Generative Learning: Variational Auto-encoders, Generative Adversarial Neural Networks; GL Applications: Image generation, font generation, anime face/celebrity face generation, video generation; Reinforcement Learning: Markov decision Processing, Deep Q

Learning, Model optimization for Deployment: Pruning, sparse decomposition, quantization and binarization, Transferred or Compact Convolutional Filters.

### **Textbook**

1. Ian Goodfellow, YoshuaBengio and Aaron Courville, Deep Learning (1 ed.), MIT Press, 2017. ISBN 978-0262035613. St

### **Reference Textbook**

1. Charu C. Aggarwal, Neural Networks and Deep Learning (1 ed.), Springer International Publishing AG, part of Springer Nature, 2018. ISBN 978-3319944623.

### **Course Outcome**

Students are able to

1. Apply the linear algebra applications in machine learning and deep learning applications
2. Understanding the Model selection and training protocols, loss functions and error optimization
3. Investigate Deep CNN and transfer learning approach for classification, and object detection.
4. and time series analysis.
5. Applying adversarial neural networks and understanding the reinforcement learning

**\*\*END\*\***

**(A36610) Internet Technologies**

**B. Tech. CSE(AI&ML) VI-Sem**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT -I**

**Introduction to PHP:** Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies.

**File Handling in PHP:** File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

**UNIT -II**

**HTML Common tags-** List, Tables, images, forms, Frames; Cascading Style sheets;

**XML:** Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

**UNIT -III**

**Introduction to Servlets:** Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

**UNIT -IV**

**Introduction to JSP:** The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

**UNIT -V**

**Client-side Scripting:** Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

**Text Books:**

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

**Reference Books:**

1. Web Programming, building internet applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Java Server Pages, Hans Bergsten, SPDO'Reilly,
3. Java Script, D. Flanagan, 6th Edition, O'Reilly Media.
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming world wide web, R.W. Sebesta, 4th Edition, Pearson.
6. Internet and World Wide Web — How to program, Dietel and Nieto, Pearson

**Course Outcomes**

**Students shall be able to**

1. write client-side scripting ,perform validation of forms using AJAX
2. write server-side scripting with PHP language
3. Describe XML parse and use XML Data with Java
4. Create Server-side programming with Java Servlets and JSP
5. Develop Client-side Scripting with Java script and form validation

**\*\*END\*\***

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**(A36611) Soft and Evolutionary Computing**
**B. Tech. CSE(AI&ML) VI-Sem**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT – I**

**Introduction to Soft Computing:** Evolutionary Computing, Soft computing versus Hard computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques. Artificial neural network: Introduction, characteristics- learning methods – taxonomy –Evolution of neural networks- basic models – important technologies – applications.

**Fuzzy logic:** Introduction – crisp sets- fuzzy sets – crisp relations and fuzzy relations: cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations, non iterative fuzzy sets. Genetic algorithm Introduction – biological background – traditional optimization and search techniques – Genetic basic concepts.

**UNIT – II**

**Neural Networks** McCulloch-Pitts neuron – linear separability – Hebb network – supervised learning network: perceptron networks – adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: autoassociative memory network, hetero-associative memory network, BAM, hopfield networks, iterative autoassociative memory network & iterative associative memory network – unsupervised learning networks: Kohonen Self Organizing Feature Maps, LVQ – CP networks, ART network.

**UNIT – III**

**Fuzzy Logic Membership functions:** features, fuzzification, methods of membership value assignments Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic – extension principle – fuzzy measures – measures of fuzziness -fuzzy integrals – fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.



## UNIT – IV

**Neuro-Fuzzy Modelling:** Adaptive Neuro-Fuzzy Inference Systems (ANFIS) - Introduction, Architecture, Hybrid learning algorithm, ANFIS as a universal approximator. Applications – Printed Character Recognition, Inverse Kinematics Problem, Automobile LPG prediction.

## UNIT– V

**Genetic Algorithms:** Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm. Particle Swarm Optimization-Introduction.

### Text Books/ References Books:

1. S.R.Jang, C.T. Sun and E.Mizutani, “NeuroFuzzy and Soft Computing”, PHI / Pearson Education 2004.
2. S.N.Sivanandam , S.N.Deepa, “Principles of Soft Computing”, Wiley India Pvt. Ltd., Paperback, 2018.
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and GeneticAlgorithm, Synthesis and Applications“, PHI Learning Pvt. Ltd., 2017.
4. Kwang H.Lee, First course on Fuzzy Theory and Applications, Springer, 2005.
5. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic-Theory and Applications, Prentice Hall, Paperback – 2015.
6. James A. Freeman and David M. Skapura, Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.

### Course Outcomes

Students shall be able to

1. Understand soft computing techniques
2. Apply the learned techniques to solve realistic problems
3. Differentiate soft computing with hard computing techniques
4. Understand Neuro-Fuzzy Modelling.
5. Understand Genetic Algorithm.

**\*\*END\*\***

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(A36612) Natural Language Processing

B. Tech. CSE(AI&ML) VI-Sem

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT- I**

**Overview:** Origins and challenges of NLP, Language and Grammar, Processing Indian Languages, NLP Applications, Information Retrieval.

**Language Modeling:** Introduction, Various Grammar-based Language Models, Statistical Language Model.

**UNIT- II**

**Information Retrieval:** Introduction, Design features of Information Retrieval Systems, Classical, Non-classical, Alternative Models of Information Retrieval, Evaluation

**Lexical Resources:** Introduction, WordNet, Frame Net, Stemmers, POS Tagger, Research Corpora

**UNIT- III**

**Word Level Analysis:** Introduction, Regular Expressions, Finite State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part of Speech Tagging, TF, IDF.

**Syntactic Analysis:** Introduction, Context-free Grammar, Constituency, Parsing, Probabilistic Parsing.

**UNIT -IV**

**Semantic Analysis:** Introduction, Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation.

**Discourse Processing:** Introduction, Cohesion, Reference Resolution, Discourse Coherence and Structure

**UNIT- V**

**Natural Language Generation:** Introduction, Architecture of NLG Systems, Generation Tasks and Representations, Application of NLG.

**Machine Translation:** Introduction, Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Translation involving Indian Languages

**Text Book**

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

## References

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.
2. James Allen, Benjamin Cummings, "Natural Language Understanding", 2<sup>nd</sup> edition, 1995

## Course Outcomes

Students shall be able to

1. Explain Origin and Challenges of NLP and Understand Language Modeling
2. Understand Information Retrieval and Lexical Analysis
3. Understand Regular Expression and Syntactic Analysis
4. Explain Semantic Analysis and Discourse Processing
5. Understand Natural Language Generation and Machine Translation

**\*\*END\*\***

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**(A36609) Deep Learning Lab****B. Tech. CSE(AI&ML) VI-Sem**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	3	1.5

**Week 1:** Consider a neural network that takes two inputs, has one hidden layer with two nodes, and an output layer with one node. Let's start by randomly initializing the weights and the biases in the network. print the weights and biases.

**Week 2:** Consider the week 1 network and compute the following

- The weighted sum.
- Assuming a sigmoid activation function, let's compute the activation of the first node.
- compute the activation of the second node
- compute the weighted sum of these inputs to the node in the output layer
- compute the output of the network as the activation of the node in the output layer

**Week 3:** Initialize a network with the following specification

- Takes 5 inputs
- has three hidden layers
- has 3 nodes in the first layer, 2 nodes in the second layer, and 3 nodes in the third layer
- has 1 node in the output layer

Print the network and its nodes

**Week 4:** Consider the Week 3 network and do the following

- Change the activation of the network from sigmoid to tanh and observe the performance of the network
- Compute the activation of every node in first hidden node
- Compute the activation of every node in second hidden node
- Compute the activation of every node in third hidden node

**Week 5:** Consider the Week 3 network and do the following

- Change the activation of the network from tanh to relu and observe the performance of the network
- Compute the activation of every node in first hidden node
- Compute the activation of every node in second hidden node
- Compute the activation of every node in third hidden node

**Week 6:**

Construct convolution neural network and perform the classification using MNIST dataset using K10 cross validation.

**Week 7:**

consider the network and dataset from week 6 visualize the hidden layers features. Compute the confusion matrix.

**Week 8:**

Construct CNN model with 7 layers and compute the performance of the model using Cats and Dogs dataset with K5 cross validation.

**Week 9:**

Construct AlexNet on MNIST dataset compute the performance evaluation matrices.

**Week 10:**

Construct VGG16 network, transfer the pre trained weights from Imagenet for classification of the cats and dogs.

**Week 11:**

Construct RNN network for MNIST dataset. Evaluate all performance metrics

**Week 12:**

Construct LSTM network for dogs and cats dataset, Evaluate all performance metrics.

**Text book**

1. Ian Goodfellow, YoshuaBengio and Aaron Courville, Deep Learning (1 ed.), MIT Press, 2017. ISBN 978- 0262035613.

**Reference Textbook.**

1. Charu C. Aggarwal, Neural Networks and Deep Learning (1 ed.), Springer International Publishing AG, part of Springer Nature, 2018. ISBN 978-3319944623.

**Course Outcomes**

**The student will be able to.**

1. Design the Feed Forward Neural and apply back propagation technique.
2. Modify the existing fully connected network with various activation functions.
3. Develop the conventional convolution neural network and visualize the hidden layer weights.
4. Design transfer learning models and transfer the pre-trained weights trained on another cohort.
5. Develop the RNN and LSTM models for computer vision problems.

**\*\*END\*\***

**B. Tech CSE(AI&ML) VI Sem**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
0	0	3	1.5

**INTRODUCTION**

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

**UNIT-I**

**Functional English:** Starting a conversation, responding appropriately and relevantly, using the right body language, Role play in Different Situations.

**UNIT-II**

**Vocabulary Building:** Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrasal verbs.

**UNIT-III**

**Group Discussion:** Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.

**UNIT-IV**

**Interview Skills:** Concept and process, pre-interview planning, opening strategies, answering strategies, Interview through tale and video- conferencing.

**UNIT-V:**

**Resume` and Technical Report Writing:** Structure and presentation, planning, defining the career objective, projecting one's strengths and skill-sets, summary, formats and styles, Letter-writing.

**Reading Comprehension:** Reading for facts, guessing meanings from context, scanning, skimming, inferring meaning and critical reading.

**COURSE OUTCOMES****Students shall be able to:**

1. Explain the rules of formal and informal situational dialogues and develop verbal & non-verbal communication skills.
2. Build academic vocabulary; use a variety of accurate sentence structures and utilize digital literacy tools to develop writing and grammar skills.

3. Express thoughts with clarity and hold discussions with everyone to develop analytical thinking.
4. Develop the skills required for attending different types of interviews.
5. Illustrate the report writing and summarize the main ideas of report; apply key elements of structure and style in drafting longer documents and read an increasing range of text.

**\*\*\*END\*\*\***

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(A30017) INDIAN CONSTITUTION  
(MANDATORY COURSE)

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B. Tech CSE(AI&ML) VI Sem

L	T	P	C
2	0	0	0

**UNIT-I**

**Introduction to Indian Constitution:** Constitution' meaning of the term, Indian Constitution- Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

**UNIT-II**

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

**UNIT-III**

**A:** Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,  
**B:** Panchayati raj: Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

**UNIT-IV**

**Concept and Development of Human Rights:** Meaning Scope and Development of Human Rights, United Nations and Human Rights – UNHCR, UDHR 1948, ICCPR 1996 and ICESCR 1966, Human Rights in India: Protection of Human Rights Act, 1993 (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and Human Rights.

**UNIT-V**

**Election Commission:** Election Commission- Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

**TEXT BOOKS:**

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics



4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans

**E-Resources:**

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

**Course Outcomes:**

**At the end of the course, the student will be able to:**

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

**\*\*END\*\***

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(A30018) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE  
(MANDATORY COURSE)

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B. Tech CSE(AI&ML) VI Sem

L	T	P	C
2	0	0	0

### UNIT I

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

### UNIT II

**Protection of traditional knowledge:** the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

### UNIT III

#### **Legal frame work and TK:**

**A:** The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);

**B:** The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

### UNIT IV

#### **Traditional knowledge and intellectual property:**

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

### UNIT V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

### TEXT BOOKS

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002

### E-RESOURCES

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

### Course Outcomes

**After completion of the course, students will be able to:**

1. Understand the concept of Traditional knowledge and its importance.
2. Know the need and importance of protecting traditional knowledge.
3. Know the various enactments related to the protection of traditional knowledge.
4. Understand the concepts of Intellectual property to protect the traditional knowledge
5. Compare and contrast the basics of Indian Traditional knowledge with modern scientific perspectives.

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**(A30556)CYBER SECURITY**  
**(Common to all branches-Mandatory Course)**

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B. Tech CSE(AI&amp;ML) VI Sem

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
2	0	0	0

**UNIT-I**

**Introduction to Cyber Security:** Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

**UNIT-II**

**Cyberspace and the Law & Cyber Forensics:** Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

**UNIT-III**

**Cybercrime:** Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT-IV**

**Cyber Security:** Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

**UNIT-V**

**Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

**Privacy Issues:** Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

**TEXT BOOK:**

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

**REFERENCES:**

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J. David Irwin, CRC Press T&F Group.

**Course Outcomes**

**Students shall be able to**

1. Explain Cyber-crimes and how they are planned
2. Describe vulnerabilities of mobile and wireless devices
3. Illustrate the crimes in mobile and wireless devices
4. Be able to use Cyber security, information assurance, and Cyber/computerForensics software/tools.
5. Identify various crimes

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**(A30013) BUSINESS MANAGEMENT & FINANCIAL ANALYSIS**

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**B. Tech CSE(AI&ML) VII Sem**

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**UNIT – I**

**Introduction of Management Concepts:** Concept, Origin, Growth, Nature, Characteristics, Scope and Principles of Management. Functions of Management: Planning, Organizing, Staffing, Directing, Coordinating, Reporting and Budgeting. Scientific Management- FW Taylor Contributions to Management Modern Management- Henry Fayol Contributions to Management Human Relations Approach to Management: Theories of Motivation and Leadership

**UNIT – II**

**Functional areas of Management:** Production Management: Systems of Production, PPC functions & Plant Layout. Financial Management: Objectives, Goals, & Functions of Financial Management. Marketing Management: Recent Trends in Marketing & Marketing Mix. Human Resources Management: Nature, Objectives, Scope & Functions of HR Management

**UNIT – III**

**Introduction to Managerial Economics & Business Environment:** Definition, Nature, Scope and Functions Managerial Economics, Difference between Micro & Macro Economics Internal & External Scanning of Business Environment, Importance of National Income, Inflation, Deflation, Stagflation, Business Cycle & Product Life Cycle Concepts. Concept & Law of Demand, Factors Influencing and Limitations. Concept of Elasticity of Demand, Types of Elasticity, Methods of Measuring Elasticity. Introduction to Demand Forecasting, Objectives, Scope, Types and Methods.

**UNIT –IV**

**Theory of Production, Cost, Price & Markets:** Production Function, Assumptions, Limitations & Types Cost Concepts, Cost-Output Relationship, Break Even Analysis Assumptions, Limitations & Applications (Simple Problems). Theory of Pricing, Objectives, Situations & Types. Introductions Markets, Demand-Supply Schedule for Equilibrium Price, Nature & Types of Competition.

**UNIT – V**

**Introduction to Financial Statement Analysis:** Types & Objectives of Business Enterprises, Conventional & Non-Conventional Sources of Financing Business Enterprise. Identification of Financial Statement Formats-Manufacturing A/c, Trading A/c, Profit & Loss A/c, Balance Sheet. Techniques of Analyzing Financial Statements: Analysis & Interpretation through

Liquidity, Leverage, Coverage, Activity, Turnover, Profitability Ratios-Simple Problems on Liquidity, Leverage and Activity Ratios

**Course Outcomes:**

At the end of the course, the student will,

1. Float different forms of business enterprises and generate capital from various sources.
2. Analyze financial stability of an enterprise in view of cut-throat competition from rivals.
3. Tune Enterprise in accordance with changes in surround economic environment.
4. Forecast demand, production, cost, capital, price under different market situations for various products of business enterprise in general.
5. Employ various functions of management in different functional areas of enterprise.
6. Review, Monitor & Control Managerial & Financial performance of an enterprise under current Economic constraints.

**Text Books:**

1. Varshney, Maheswari (2003), Managerial Economics, Sultan Chand, New Delhi, India.
2. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.

**Reference Books:**

1. Kotler Philip & Keller Kevin Lane: Marketing Management 12/e, PHI, 2005
2. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005 Thomas N. Duening & John M. Ivancevich Management—Principles and Guidelines, Biztantra, 2003.
3. Ambrish Gupta (2004), Financial Accounting for Management, Pearson Education, New Delhi, India.
4. Domnick Salvatore (2011), Managerial Economics in a Global Economy, 7th edition, Oxford University Press, United States of America.
5. Narayanaswamy (2005), Financial Accounting, A Managerial Perspective, Prentice Hall of India private Ltd, New Delhi, India.
6. Aryasri (2005), Managerial Economics and Financial Analysis, 2nd edition, Tata McGraw Hill, New Delhi, India

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## **PROFESSIONAL ELECTIVES**



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(A30528) DATA WAREHOUSING AND DATA MINING  
(PROFESSIONAL ELECTIVE-I)

B. Tech CSE(AI&ML) V Sem

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**UNIT -I**

**Data Warehousing:** Introduction to Data warehouse, differences between operational Database Systems and warehouses, Data Warehouse Architecture and its components , Data Warehouse Characteristics, ETL, Multi-Dimensional data model, Schema Design-Star-Snowflake-Galaxy Schema, Fact Table, Types of fact tables, Dimension Table characteristics, OLAP Cube and Operations, OLAP Server Architecture-ROLAP,MOLAP,HOLAP.

**UNIT –II**

**Introduction to Data Mining:** Introduction, what is data mining, Definition, KDD process, issues in Data Mining, Data mining Tasks.

**Data Preprocessing:** Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Data transformation, Discretization, Concepts Hierarchy Generation, Measures of Similarity and Dissimilarity-Basics

**UNIT –III**

**Association Rule Mining:** Problem Definition, Frequent Item Set Generation, The Apriori principle, Support and Confidence measure, Association Rules Generation: Apriori Algorithm, FP-Growth Algorithms, Compact Representation of Frequent Item Set (Maximal and Closed Frequent Item sets).

**UNIT –IV**

**Classification:** Problem definition, General approaches to solve Classification problems, Evaluation of a Classifier, Classification techniques, Decision Tree -Decision tree construction, Methods for Expressing attribute test condition, Measures for selecting the Best Split, Algorithm for Decision tree Induction, Naive Bayes Classifiers, Bayesian Belief Networks, K - Nearest neighbor classification algorithm & characteristics.

**UNIT –V**

**Cluster Analysis:** Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, K-Means Clustering, K-Means additional Issues, PAM Algorithm, Hierarchical Clustering Agglomerative methods and divisive methods, Basic

Agglomerative Hierarchical clustering algorithms, Specific techniques, Key issues in Hierarchical Clustering, Strengths and Weakness, Outlier Detection

**Text Books:**

1. Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber Harcourt India.
2. Introduction to Data Mining –Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education

**Reference Books:**

1. Data Mining Techniques – Arun K Pujari, University Press.
2. Data Warehousing in the Real World – Sam Anahory& Dennis Murray. Pearson Edn Asia.
3. Data Warehousing Fundamentals – PaulrajPonnaiah Wiley Student Edition

**Course Outcomes**

1. Explain why the data warehouse in addition to database systems.
2. Perform the pre-processing of data and apply mining techniques on it.
3. Identify the association rules, classification and clusters in large data sets.
4. Solve real world problems in business and scientific information using data mining.
5. Compare and Contrast various Clustering Algorithms.

**\*\*END\*\***

**(A36613)Advanced Python Programming**  
**(PROFESSIONAL ELECTIVE-I)**

**B.Tech CSE(AI&ML) V Sem**

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**UNIT-I**

**Python Fundamentals:** Python Character Set ,Python Tokens, Keywords, Identifiers, Literals, Operators Variables and Assignments, Input and Output in Python, Program control flow, functions, modules, packages, class and objects ,Object oriented Programming.

**File Operations:** Text and Bytes files, Opening a file, Reading and Writing Files, Other File tools, Ms-Excel,

**UNIT-II**

**Basic numerical processing using Python:** Introduction to numpy , Creation of vectors and matrices , Matrix manipulation Indexing and Slicing

**Basic data analysis using Python:** Introduction to Pandas , Pandas data structures – Series and DataFrame , Data wrangling using pandas , Loading a dataset into a dataframe , Selecting Columns from a dataframe, Selecting Rows from a dataframe , Adding new data in a dataframe ,Deleting data from a dataframe.

**UNIT-III**

**SCIPY:** Introduction to SciPy, Create function, modules of SciPy, Introduction to NLTK Library in Python.

**MATPLOTLIB:** Scatter plot,Bar charts, histogram,Stack charts, Legend title Style, Figures and subplots, Plotting function in pandas,Labelling and arranging figures,Save plots .

**UNIT-IV**

**Database programming using Python:**Connecting to a database (mysql) using Python ,Sending DML and DDL queries and processing the result from a Python.  
Introduction to Flask, Basic application structure, templates, webforms.

**UNIT-V**

**GUI programming:** Installing PyQT, Introduction, pop-up alert, dialogues: dumb dialogues, standard dialogs, smart dialogs, main window, handling user actions, Using Qt designer, data handling and custom file formats, Layouts and multiple documents, events, clipboard, drag and

drop, custom widget, item-based graphics, rich text and printing. Creating an application for concurrency converter.

**Web scraping:** Installing beautiful soup, running beautiful soup, Scraping Webpages

***Text Books:***

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing
3. Web Scraping with Python by Ryan Mitchell, Published by O'Reilly Media

***Reference Books:***

1. Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox publishing
3. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3, The Pragmatic Bookshelf, 2nd edition
4. Flask Web Development by Miguel Grinberg by O'Reilly

**Course Outcomes:**

At the end of the course, the student will be

1. Able to do fundamental programming and File Operation
2. Able to work on numpy (numerical processing) and pandas (data analysis)
3. Able to understand SciPy and work on NLTK library
4. Able to work on Database by using python
5. Able to create GUI by using PyQt

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**(A36614) NETWORK SECURITY  
(PROFESSIONAL ELECTIVE-I)**

**B.Tech CSE(AI&ML) V SEM**

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**UNIT -I:**

**Introduction:** Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security. Symmetric Encryption and **Message Confidentiality:** Symmetric Encryption Principles, Symmetric Block Encryption Algorithm, Random and Pseudorandom Numbers, Stream Ciphers and RC4, Cipher Block Modes of Operation.

**UNIT -II:**

**Public-Key Cryptography and Message Authentication:** Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures. Key Distribution and User Authentication: Symmetric Key Distribution Using Symmetric Encryption, Kerberos, Key Distribution Using Asymmetric Encryption, X.509 Certificates, Public-Key Infrastructure.

**UNIT- III:**

**Transport-Level Security:** Web Security Considerations, Secure Socket Layer and Transport Layer Security, Transport Layer Security, HTTPS, Secure Shell (SSH). **Electronic Mail Security:** Pretty Good Privacy, S/MIME, Domain Keys Identified Mail.

**UNIT IV:**

**IP Security:** IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange. **Malicious Software:** Types of Malicious Software, Viruses, Virus Countermeasures, Worms, Distributed Denial of Service Attacks.

**UNIT -V:**

**Firewalls:** The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Location and Configurations. **Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

**Text Books:**

1. William Stallings, Network Security Essentials, 6th Edition, Pearson Education.

2. Atul Kahate, Cryptography and Network Security, 3rd Edition, McGraw Hill. 2020-2021 152

**Reference Books:**

1. William Stallings, Cryptography and Network Security - Principles and Practice, 6th Edition, Pearson Education.
2. Forouzan Mukhopadhyay, Cryptography and Network Security, 3rd Edition, Mc Graw Hill.

**Course Outcomes:**

At the end of the course, the student will

1. Understand OSI architecture and Encryption principle
2. Understand Public-Key Cryptography and Message Authentication
3. Know Transport layer security and their protocols and Electronic mail security and their protocols
4. Understand IP security and malicious software
5. Be able to understand Firewall, cryptography and security

**\*\*END\*\***

(A30542) CLOUD COMPUTING  
(PROFESSIONAL ELECTIVE-II)

B.Tech CSE(AI&ML) VI Sem

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**UNIT -I**

**Computing Paradigms:** High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

**UNIT –II**

**Cloud Computing Fundamentals:** Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

**UNIT –III**

**Cloud Computing Architecture and Management:** Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

**UNIT –IV**

**Cloud Service Models:** Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

**UNIT –V**

**Cloud Service Providers:** EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue, service, Microsoft, Windows

Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform.

**Text Books:**

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

**Reference Books:**

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

**Course Outcomes**

The student shall be able to

1. Explain Distributed System Modeling, Clustering and Virtualization
2. Discuss basic concepts of cloud computing.
3. Distinguish Infrastructure as a Service(IAAS) & Platform and Software as a Service(PAAS/SAAS).
4. Design & implement cloud computing applications.
5. Explore some important cloud computing driven commercial systems.

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**(A36615) HIGH PERFORMANCE COMPUTING  
(PROFESSIONAL ELECTIVE-II)**

**B.Tech CSE(AI&ML) VI Sem**

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**UNIT-I**

History, GPU Architecture, Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel Programming, CUDA OpenCL / OpenACC, Kernels Launch parameters, Thread hierarchy, Warps/Wavefronts, Threadblocks/Workgroups, Streaming multiprocessors, 1D/2D/3D thread mapping, Device properties, Simple Programs.

**Unit-II**

Memory hierarchy, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories.

**Unit-III**

Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Worklists, Linked-lists. Synchronization across CPU and GPU

**Functions:** Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.

**UNIT-IV:**

Debugging GPU Programs. Profiling, Profile tools, Performance aspects

**Streams:** Asynchronous processing, tasks, Task-dependence, overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.

**UNIT-V:****Case Studies**

Image Processing, Graph algorithms, Simulations, Deep Learning

Dynamic parallelism, Unified Virtual Memory, Multi-GPU, processing, Peer access, Heterogeneous processing

### **Textbooks**

1. David Kirk and Wen-mei Hwu, Programming Massively Parallel Processors: A Hands-On Approach, 2nd Edition, Publisher: Morgan Kaufman, 2012, ISBN: 9780124159921.
2. Shane Cook, CUDA Programming: A Developer's Guide to Parallel Computing with GPUs, Morgan Kaufman; 2012 (ISBN: 978-0124159334)

### **Course outcomes**

1. Define terminology commonly used in parallel computing, such as efficiency and speedup.
2. Describe common GPU architectures and programming models.
3. Implement efficient algorithms for common application kernels, such as matrix multiplication.
4. Given a problem, develop an efficient parallel algorithm to solve it.
5. Given a problem, implement an efficient and correct code to solve it, analyze its performance, and give convincing written and oral presentations explaining the achievements.

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**(A30537) DATA ANALYTICS WITH R**  
**(PROFESSIONAL ELECTIVE-II)**

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**B. Tech CSE(AI&ML) VI SEM**

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**UNIT -I**

Introduction, how to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes. R Programming Structures, Control Statements, Loops, - Looping Over Non-Vector Sets, - If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion

**UNIT –II**

Introduction of Data Science, Basic Data Analytics using R, R Graphical User Interfaces Data Import and Export, Attribute and Data Types, Descriptive Statistics, Exploratory Data Analysis, Visualization Before Analysis, Dirty Data, visualizing a Single Variable, Examining Multiple Variables, Data Exploration Versus Presentation

**UNIT –III**

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains

**UNIT –IV**

Discover R's packages to do graphics and create own data visualizations. Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot () Function, Customizing Graphs, Saving Graphs to Files. Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests, ANOVA Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests,

**UNIT –V**

Overview of Clustering, K-means, Use Cases, Overview of the Method, Perform K-means Analysis using R. Classification, Decision Trees, Overview of a Decision Tree, Decision Tree Algorithms, Evaluating a Decision Tree. Decision Tree in R, Bayes 'Theorem, Naïve Bayes Classifier, Smoothing, Naïve Bayes in R

**Text Books:**

1. The Art of R Programming, Norman Matloff, Cengage Learning
2. David Dietrich, Barry Heller and Beibei Yang, —Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services,

**Reference Books:**

1. R in Action, Rob Kabacoff, Manning Nathan Marz, James Warren, —Big Data- Principles and best practices of scalable real-time data systems, Edition 2015, Dreamtech Press,

**Course Outcomes**

The student shall be able

1. Explain Data Science concepts.
2. Explore data and analyze it using R.
3. Implement classification, clustering and feature selection methods with R.
4. Understand Regression Generalized Linear Models.
5. Perform K-means Analysis using R.

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**(A36616) Intelligent Information Retrieval**  
**(PROFESSIONAL ELECTIVE-III)**

**B.Tech CSE(AI&ML)VII SEM**

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**UNIT-I**

**Fundamentals of IR Systems, Models and Indexing:** Overview of IR Systems, Information retrieval using the Boolean model, The dictionary and postings lists, Tolerant retrieval, Automatic Indexing, Index construction and compression, Scoring, Vector space model and term weighting

**UNIT-II**

**Document Representation and Analysis:** Statistical Characteristics of Text, Regular Expressions, Text Normalization, Edit Distance, NGram Language Models, Naive Bayes and Sentiment Classification-Logistic Regression for Document Analysis.

**UNIT-III**

**Query Processing and Evaluation:** Basic Query Processing, Data Structure and File Organization for IR, Evaluation in information retrieval-Relevance feedback, User Profiles, Collaborative Filtering and query expansion.

**Retrieval Models:** Similarity Measures and Ranking, Boolean Matching, Vector Space Models, Probabilistic Models, XML Retrieval, Language models for information retrieval.

**UNIT-IV**

**Text Classification and Clustering:** Text classification-vector space classification-support vector machines and machine learning on documents-Clustering-flat clustering- hierarchical clustering- Matrix decompositions and Latent semantic indexing

**UNIT-V**

**Web Search Analysis:** Web search basics. web characteristics-index size and estimation- near duplicates and shingling web crawling-distributing indexes- connectivity servers-link analysis- web as a graph-PageRank Hubs and authoritative pages- summarization-question answering.

**Web Mining and Online IR Systems:** Web mining and its applications-Mining Twitter, Facebook, Instagram, LinkedIn, Mailboxes and GitHub. Online IR systems- online public access catalogs-digital libraries-architectural issues document models -representations and access protocols.

**Text Book(s)**

1. C. D. Manning, P. Raghavan, and H. Schutze, Introduction to Information Retrieval, Cambridge University Press (2008)
2. Ricardo Baezce Yates, Berthier Ribeiro-Neto, Modern Information Retrieval: The Conceptsand Technology behind Search (2ndEd, 2010)
3. Mikhail Klassen, Matthew A. Russell, Mining the Social Web,O'Reilly Media, Inc., 3Rd Edition (2019)

**Reference Books**

1. Ceri, S., Bozzon, A., Brambilla, M., Della Valle, E., Fraternali, P. and Quarteroni, S., 2013. Web information retrieval. Springer Science & Business Media.
2. D. Jurafsky, and J. Martin, Speech and language processing : an introduction to naturallanguage processing, computational linguistics, and speech recognition, Pearson Prentice Hall, Second Edition (2013)
- 3.Giles, Mark Smith, John Yen, Advances in Social Network Mining and Analysis , Springer,2010
- 4.Bruce Croft, Donald Metzler and Trevor Strohma, Search Engines: Information Retrieval in Practice (1st Ed 2009)

**Course Outcomes**

The student shall be able to

1. Explain Information Retrieval System, indexing and modeling
2. Do document representation and analysis with help of different model
3. Do query processing for Information retrieval
4. Understand text clustering and classification
5. Explain web search analysis, online information retrieval system and web mining.

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**(A36617) ARTIFICIAL INTELLIGENCE FOR CYBERSECURITY  
(PROFESSIONAL ELECTIVE-III)**

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**B.Tech CSE(AI&ML) VII SEM**

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**UNIT -I**

Introduction – Problems that AI Solves – Why AI in Cyber security – Current Cyber Security Solutions - Structured data, Unstructured data – Supervised learning – Unsupervised learning – Reinforcement learning .

**AI and DDoS:** Time series – Types of Time series – Time Series analysis in Cyber Security – Detecting DDOS with Time Series – Predicting DDOS attacks – Ensemble Techniques for Cyber security – Types of Ensemble – Types of Ensemble Algorithms – Bagging, Boosting, Stacking, Bayesian Model - Ensemble Method to detect Cyber attack.

**UNIT –II**

**Detection of malicious web pages, URLs:** URL Blacklisting – Drive by download URL- Command and Control URLs – Phishing URLs – Using Heuristics to detect Malicious Pages – Data for the analysis – Feature Extraction – Lexical Features – Web Content based Features – Host based features – site Popularity features

**UNIT –III**

**CAPTCHA and Scan Detection:** Using AI to crack CAPTCHA – Types of CAPTCHA – ReCAPTCHA – Breaking a CAPTCHA – Solving CAPTCHA with neural network - Machine Learning in Scan Detection - Machine-Learning Applications in Scan Detection

**UNIT –IV**

**Context based Malicious event detection:** Context based Malicious event detection – Adware – Bots –Bugs – Ransomware – Rootkit – Spyware – Trojan horses – Viruses – Worms – Malicious Injections in Wireless networks.

**AI and IDS:** Architecture of IDS based on Neural networks – Intelligent flow based IDS - Multi-Agent IDS – AI based Ensemble IDS – Machine Learning in Hybrid Intrusion Detection Systems - MachineLearning Applications in Hybrid Intrusion Detection: Anomaly - Misuse Sequence Detection System - Parallel Detection System

## UNIT -V

**AI and Mail Server:** Types of Mail Server – Data Collection from mail server – Naive Bayes theorem to detect spam – Laplace smoothing – Featurization Techniques to covert text-based emails to numeric values Logistic regression to spam filters - Anomaly detection techniques for SMTP and HTTP

### Textbook(s)

1. Hands-On Machine Learning for Cyber Security: Safeguard your system by making your machine intelligence using the python ecosystem, Soma Harder, Sinan Ozdemir, Packt Publishing Ltd, 2018.
2. The state of the Art in Intrusion Detection System, AI-Sakib Khan Pathan, CRC Press, Taylor & Francis Group, 2014
3. Data Mining and Machine Learning in Cyber Security, Sumeet Dua and Xian Du, CRC Press, 2011.

### Reference Books

1. Cybersecurity for Dummies, Brian Underdahl, Wiley, 2011
- 2 Cryptography and Network security, Behrouz A. Forouzan , Debdeep Mukhopadhyay, Mcgraw Hill Education, 2nd Edition, 2011

### Course Outcomes

The student shall be able to

1. Explain introduction of AI for cyber security and DDoS
2. Explain URLs and Detection of malicious web pages
3. Understand CAPTCHA technique and Scan Detection technique
4. Explain Context based Malicious event detection and Intrusion Detection System
5. Understand mail server and its working

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**(A36618) Robotic Process Automation  
(PROFESSIONAL ELECTIVE-III)**

**B.Tech CSE(AI&ML)VII SEM**

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**UNIT-I**

Benefits of RPA, components of RPA, Introduction to RPA, Application of RPA, Evaluation of RPA, RPA Platform, UiPath Studio, UiPath Robot, UiPath Orchestrator, Downloading and installing UiPath Studio, Task recorder, example of the task recorder: emptying trash in gmail, emptying recycle bin, Sequence, Flowchart, and Control Flow, Sequencing the workflow.

**UNIT- II**

Understanding the application, Basic Web Concepts, Protocols, Email Clients, Data Structures, DataTables, basic algorithms, Software Processes, Software Design, SDLC.

**UNIT-III**

Scripting, .Net Framework, .Net Fundamentals, XML, Control structures and functions, XML, HTML, CSS, Variables & Arguments, History of Automation, RPA vs. Automation, Processes & Flowcharts.

**UNIT- IV**

Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case.

**UNIT-V**

RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem.

**Textbook**

1. Alok Mani Tripathi, Learning Robotic Process Automation (1 ed.), Packt Publishing, 2018. ISBN 978-1788470940.

**Reference book**

2. Frank Casale, Rebecca Dilla, Heidi Jaynes and Lauren Livingston, Introduction to Robotic Process Automation: A Primer (1 ed.), Institute of Robotic Process Automation, Carnegie Mellon Packt Publishing, University, 2015. ISBN ASIN-B00ZQCQBFU.

### **Course Outcomes**

The student shall be able to

1. Explain Robotic process automation
2. Understand RPA application and its protocol
3. Understand .net framework and work on website and web-server
4. Work on RPA programming and RPA development.
5. Understand RPA design and risk and challenges.

**\*\*END\*\***

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**(A36619) Big Data Analytics and Business Intelligence  
(PROFESSIONAL ELECTIVE-IV)**

**B.Tech CSE(AI&ML)VII SEM**

$\frac{L}{3}$	$\frac{T}{0}$	$\frac{P}{0}$	$\frac{C}{3}$
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**UNIT I:**

**Introduction to Data Analytics:** Data and Relations, Data Visualization, correlation, Regression, Forecasting, Classification, Clustering, **Big Data Technology Landscape:** Fundamentals of Big Data, Big Data Technology Component, Big Data Architecture, Big Data Warehouse.

**UNIT II:**

Functional vs Procedural programming models for Big Data, Business implementation of Big data: Big data implementation, Big data workflow, operational databases. Introduction to Hadoop Ecosystem, Hadoop Overview, HDFS, MapReduce.

**UNIT III:**

Pig Overview, Pig Grunt Shell, Hive Architecture, HQL, Advanced HQL, Spark Overview, Spark RDD, SparkR.

**UNIT IV:**

Latest trends in big data, big data computation, more on big data storage, big data computational limitations, Big data analytics: Big data analytics, framework for big data analysis.

**UNIT V:**

Approaches for analysis of big data, Decision trees, predictive analysis on big data, Text analysis and big data using twitter data, role of data analyst, Introduction to Business Intelligence: Business View of IT applications, Digital Data, OLTP vs OLAP, Why, What and How BI& BI project life cycle, business intelligence vs business analytics.

**TEXTBOOKS**

1. Michael Minelli, Michele Chambers and Ambiga Dhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses (1 ed.), Wiley CIO, 2013. ISBN 978-8126544691.
2. Alapati Sam R., Expert Hadoop Administration: Managing, Tuning, and Securing Spark, YARN, and HDFS (1 ed.), Pearson Education, 2017. ISBN 978-9386873538.

**REFERENCE BOOKS/LEARNING RESOURCES:**

1. T. white, Hadoop: The Definitive Guide (3 ed.), O' Reilly Media, 2012. ISBN 978-1449311520.

### **Course Outcomes**

The student shall be able to

1. Understand Data Analytics and Big Data Technology
2. Understand Big Data fundamental and programming and Hadoop
3. Explain pig, HQL and Spark
4. Explain Latest trend in Big Data and framework for big data
5. Explain different analysis of big data and business intelligence of big data

**\*\*END\*\***

**(A36620) Time Series Analysis**  
**(PROFESSIONAL ELECTIVE-IV)**

**B.Tech CSE(AI&ML)VII SEM**

$\frac{L}{3}$	$\frac{T}{0}$	$\frac{P}{0}$	$\frac{C}{3}$
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**UNIT-I**

Introduction to Time Series and Forecasting -Different types of data-Internal structures of time series-Models for time series analysis-Autocorrelation and Partial autocorrelation. Examples of Time series Nature and uses of forecasting-Forecasting Process-Data for forecasting –Resources for forecasting.

**UNIT-II**

Statistics background for forecasting: Graphical Displays -Time Series Plots - Plotting Smoothed Data - Numerical Description of Time SeriesData - Use of Data Transformations and Adjustments- General Approach to Time Series Modeling andForecasting- Evaluating and Monitoring Forecasting Model Performance.

**UNIT-III**

Time series regression models. Introduction - Least Squares Estimation in Linear Regression Models - Statistical Inference in LinearRegression- Prediction of New Observations - Model Adequacy Checking -Variable Selection Methodsin Regression - Generalized and Weighted Least Squares- Regression Models for General Time SeriesData- Exponential Smoothing-First order and Second order.

**UNIT-IV**

Autoregressive Moving Average (ARMA) Models - Stationarity and Invertibility of ARMA Models -Checking for Stationarity using Variogram- Detecting Nonstationarity - Autoregressive IntegratedMoving Average (ARIMA) Models - Forecasting using ARIMA - Seasonal Data - Seasonal ARIMA Models-Forecasting using Seasonal ARIMA Models Introduction - Finding the “BEST” Model -Example: InternetUsers Data- Model Selection Criteria - Impulse Response Function to Study the Differences in Models- Comparing Impulse Response Functions for Competing Models .

## UNIT-V

Multivariate Time Series Models and Forecasting - Multivariate Stationary Process- Vector ARIMAModels - Vector AR (VAR) Models - Neural Networks and Forecasting -Spectral Analysis – BayesianMethods in Forecasting.Multivariate Analysis of Variance and Covariance, Canonical Correlation Analysis, Structural Equation Modeling, Factor Analysis, Cluster Analysis.

## TEXT BOOKS

1. Introduction To Time Series Analysis And Forecasting, 2nd Edition, Wiley Series In ProbabilityAnd Statistics, By Douglas C. Montgomery, Cheryl L. Jen(2015)<https://b-ok.cc/book/2542456/2fa941>
2. Master Time Series Data Processing, Visualization, And Modeling Using Python Dr. Avishek PalDr. Pks Prakash (2017) <https://b-ok.cc/book/3413340/2eb247>
3. Time Series Analysis And Forecasting By ExampleSorenBisgaardMurat Kulahci TechnicalUniversity Of Denmark Copyright c 2011 By John Wiley & Sons, Inc. All Rights Reserved.<https://b-ok.cc/book/1183901/9be7ed>

## REFERENCE BOOKS

4. Peter J. Brockwell Richard A. Davis Introduction To Time Series And ForecastingThird Edition.(2016). <https://b-ok.cc/book/2802612/149485>
5. Multivariate Time Series Analysis and ApplicationsWilliam W.S. Wei Department of StatisticalScience Temple University, Philadelphia, PA, SA This edition first published 2019 John Wiley &Sons Ltd. <https://b-ok.cc/book/3704316/872fbf>
6. Time Series Analysis by James D Hamilton Copyright c 1994 by prince town university press.<https://b-ok.cc/book/3685042/275c71>

## Course Outcomes

The student shall be able to

1. Explain Time-series and forecasting

2. Explain statistic background for forecasting and modeling of forecasting and time-series.
3. Understand regression models for time series
4. Explain ARMA and ARIMA
5. Explain Multivariate Time Series Models and Forecasting

**\*\*END\*\***

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**(A36621) Speech and Language Processing**  
**(PROFESSIONAL ELECTIVE-IV)**

**B.Tech CSE(AI&ML)VII SEM**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**UNIT-1**

**N-gram Language Model:** Overview of NLP , Understanding Words ,Corpora, Bag of Words ,Text normalization, N-grams ,Smoothing ,Perplexity

**Word Embedding:** Lexical & Vector semantics, Words and vectors , Cosine similarity , Vector-Space models, TFIDF ,Word2vec , Bias and embedding , Evaluating vector models

**Unit-2**

**Sequence Processing:** Text Classification ,Sentiment Analysis, Recurrent neural networks , Context in RNNs, Transformer networks ,Machine translation ,Encoder-decoder RNNs ,Attention ,Beam search ,Evaluation of translation

**Dialogue Systems:** IR based question answering system , Entity linking ,Knowledge based Q&A , Language models for Q&A ,Evaluation of systems ,Chatbots , Human dialogue ,Frame based dialogue ,Dialogue state architecture ,Evaluating dialogue systems.

**Unit-3**

**Speech Production and Perception:** Fundamentals of speech production ,Short-Term Fourier representation of Speech , Functions of the ear ,Perception of sound , Vocal tract model

**Unit-4**

**Speech Signal Processing:** Short-Time analysis of the signal,Energy, Zerocrossing,Auto-correlation, Short time Fourier analysis , Spectrogram,Filter-banks,Cepstrum, Linear Predictive Coding , Mel-Frequency Cepstrum

**Unit-5**

**Automatic Speech Recognition:** Automatic Speech recognition formulation , HMM based speech recognition , Isolated word recognition , Large vocabulary continuous speech recognition ,Deep learning for language modeling and automatic speech recognition ,Evaluation metrics. Speaker recognition , Alexa/Google assistant based application development.

**Text Book(s)**

1. Speech and Language Processing, 3rd Ed., Daniel Jurafsky & James H. Martin, 2020.
2. Theory and Applications of Digital Speech Processing, Lawrence R. Rabiner, Ronald W. Schafe, 1st Edn. Pearson, 2010.

**Reference Books**

1. Digital Speech Processing Using Matlab, E. S. Gopi, Springer, 2014
- 2 Voice Applications for Alexa and Google Assistant, Dustin Coates, Manning Publications,



2019.

3 Speech and Audio Processing A MATLAB -based Approach, Ian Vince, **McLoughlin**, Cambridge Press, 2016.

4. Natural Language Processing with TensorFlow, Thushan Ganegedara, Packt, 2018

5. An Introduction to Voice Computing in Python, Jim Schwoebel, NeuroLex, 2018

6. Text Analytics with Python, Dipanjan Sarkar, Apress, 2019.

### **Course Outcomes**

The student shall be able to

1. Understand Natural Language Processing and N-gram Language Model and Word Embedding
2. Explain Sequence Processing and Dialogue Systems
3. Explain Speech Production and Perception
4. Understand Speech Signal Processing and Cepstrum
5. Explain Automatic Speech Recognition

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**(A36622) Augmented Reality and Virtual Reality**  
**(Professional Elective-V)**

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B.Tech CSE(AI&amp;ML)VII SEM

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**Unit I**

**Virtual Reality and Virtual Environment:** Introduction, Computer graphics, Real-time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

**Unit II:****Computer Graphics And Geometric**

**Modelling:** Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereoscopic projection, Colour theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling. Illumination models, Reflection models, Shading algorithms. **Geometrical Transformations:** Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

**Unit III:**

**Input:** Tracker, Sensor, Digital Gloves, Movement Capture, Video-based Input, 3D Menus & 3D Scanner etc. **Output:** Visual / Auditory / Haptic Devices. Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems. **Animating the Virtual Environment:** Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system.

**Unit IV:**

**Augmented Reality:** Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, enhancing interactivity in AR environments, evaluating AR systems

**Unit V:**

**Development Tools and Frameworks:** Human factors: Introduction, the eye, the ear, the somatic senses. **Hardware:** Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. **Software:** Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML, AR / VR Applications

### **Textbooks**

1. Grigore C. Burdea, Philippe Coiffet , Virtual Reality Technology, Wiley 2016
2. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

### **Reference Textbooks**

3. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
4. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.
5. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.

### **Course Outcomes**

The student shall be able to

1. Understand VirtualRealityandVirtualEnvironment
2. ComputerGraphicsAndGeometric Modelling andGeometricalTransformations
3. Explain different input and output modes and Animating the Virtual Environment
4. Explain Augmented Reality and its method
5. Explain Development Tools and Frameworks ans Hardware and Software

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**(A30539) ETHICAL HACKING**  
**(Professional Elective-V)**

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**B. Tech CSE(AI&ML)VII SEM**

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**UNIT-I**

Introduction to Ethical Hacking, Fundamentals of Computer Networking, TCP/IP protocol stack, IP addressing and routing, TCP and UDP, IP Subnets, Routing protocols, IP Version 6. IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch file Programming.

**UNIT-II**

Hacking windows, Network hacking, Web hacking- Password hacking. A study on various attacks – Input validation attacks, Buffer overflow attacks, Privacy attacks, Vulnerability assessment: OpenVAS, Nessus, etc. Social Engineering attacks, Malware threats, penetration testing by creating backdoors.

**UNIT-III**

Introduction to cryptography, private-key encryption, public-key encryption, cryptographic hash functions, digital signature and certificate, applications. Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process

**UNIT-IV**

Steganography, biometric authentication, network-based attacks, DNS and Email security, Sniffing: Wireshark, ARP Poisoning, DNS Poisoning, Hacking Wireless networks, Denial of Service attacks, Architecture strategies for computer fraud prevention – Protection of Web sites – Intrusion detection system – NIDS, HIDS – Penetrating testing process.

**UNIT-V**

Elements of Hardware security: Side-Channel attacks, Physical inclinable functions, hardware Trojans, Hacking web applications: vulnerability assessment, SQL Injection, Cross-Site Scripting Penetration Testing Steps, Pen- Test Legal Framework, Automated Penetration Testing Tools, Pen -Test Deliverables

**Text Books:**

1. Kenneth C. Brancik—Insider Computer Fraud/Auerbach Publications/Taylor & Francis Group—2008.
2. Ankit Fadia—Ethical Hacking/second edition/Macmillan India Ltd, 2006/3. Data and Computer Communications -- W. Stallings.

**Reference Books:**

1. Hacking Exposed Web 2.0, by Rich Annings, Himanshu Dwivedi, Zane Lackey, Tata Mc Graw hill Edition
2. Ethical Hacking & Network Defense, Michael T. Simpson edition
3. Hacking Exposed Windows, Joel Scambray, CISSP, Stuart McClure, CISSP, Third Edition, Tata McGraw hill edition
4. Hacking Exposed Window server 2003, Joel Scambray Stuart McClure, Tata McGraw hill Edition

**Course Outcomes**

Students shall be able to

1. Describe various types of DoS attacks.
2. Explain Network, Web, Password Hacking
3. Describe cryptography techniques.
4. Explain Email-security, Sniffing, SQL injection
5. Perform Penetration Test.

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**(A36623) Reinforcement Learning**  
**(Professional Elective-V)**

**B.Tech CSE(AI&ML) VII SEM**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT-I**

**Introduction to RL:** Course logistics and overview, Introduction to Reinforcement Learning (RL), Origin and history of RL research, RL and its connections with other ML branches. Linear algebra overview, Probability overview, Sequential Decision Making, Modelling the world, Components of a reinforcement learning agent, Taxonomy of reinforcement learning agents. Introduction to Instance based learning.

**UNIT-II**

Markov Decision Processes and Bandit Algorithms, Policy Gradient Methods & Introduction to Full RL, Reinforcement Learning Problems, MDP Formulation, Bellman Equations & Optimality Proofs, Markov Processes, Markov Reward Processes, Markov Decision Processes, Bellman Equation, Bandit Algorithms (UCB, PAC, Median Elimination, Policy Gradient), Contextual Bandits.

**UNIT-III**

Dynamic Programming and Temporal Difference Methods, DQN, Fitted Q & Policy Gradient Approaches, Introduction to Dynamic Programming, Policy Evaluation (Prediction), Policy Improvement, Policy Iteration, Hierarchical Reinforcement Learning, Value Iteration, Generalized Policy Iteration, Hierarchical RL: MAXQ, Asynchronous Dynamic Programming, Efficiency of Dynamic Programming, Temporal Difference Prediction, Why TD Prediction Methods, On-Policy and Off-Policy Learning, Q-learning, Reinforcement Learning in Continuous Spaces, SARSA.

**UNIT-IV**

Value Function, Bellman Equation, Value Iteration, and Policy Gradient Methods, Value Function, Bellman Equations, Optimal Value Functions, Bellman Optimality Equation, Optimality and Approximation, Value Iteration, Introduction to Policy-based Reinforcement Learning: Policy Gradient, Monte Carlo Policy Gradients, Generalized Advantage Estimation (GAE), Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Incremental Implementation, Policy optimization methods (Trust Region Policy Optimization (TRPO) and Proximal Policy Optimization (PPO)).

**UNIT-V**

Deep Reinforcement Learning - Masters Atari Games-Markov Decision Processes-Policy Versus Value Learning, Pole-Cart with Policy Gradients-Q-Learning and Deep Recurrent Q-Networks. Applications in Object Recognition and Computer Vision.

## TEXTBOOKS

1. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction (2 ed.), MIT Press, 2017. ISBN 978-0262039246.
2. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective (1 ed.), MIT Press, 2012. ISBN 978-0262018029.

## REFERENCE BOOKS

1. Dimitri Bertsekas and John G. Tsitsiklis, Neuro Dynamic Programming, Athena Scientific (1 ed.), Athena Scientific, 1996. ISBN 978-1886529106.
2. Mohit Sewak, Deep Reinforcement learning: Frontiers of Artificial Intelligence (1 ed.), Springer, 2019. ISBN 978-9811382840.
3. Sugiyama, Masashi, Statistical reinforcement learning: modern machine learning approaches (1 ed.), Chapman and Hall/CRC, 2015. ISBN 978-1439856895

## Course Outcomes

The student shall be able to

1. Understand Reinforcement Learning
2. Explain Markov Decision Processes and Bandit Algorithms and Policy Gradient Methods
3. Explain Dynamic Programming and Temporal Difference Methods and Hierarchical Reinforcement Learning
4. Explain Value Function, Bellman Equation, Value Iteration, and Policy Gradient Methods
5. Deep Reinforcement Learning and Applications in Object Recognition and Computer Vision

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**(A36624) Artificial Intelligence in Healthcare**  
**(Professional Elective-VI)**

**B.Tech CSE(AI&ML) VIII SEM**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT I:**

Medical Imaging Introduction, Types of medical images, physics of the medical imaging, conventional radiology, Ultrasound, Computed tomography, MRI, Nuclear Medicine, cardiovascular and interventional radiology, breast imaging

**UNIT II:**

**Training Neural Networks for Medical Images:** Hyper-parameter search, data augmentation, transfer learning, domain adaption, multi-task learning, semi-supervised and unsupervised learning.

**UNIT III:**

**Applying AI in Medical Imaging:** Expert systems to deep learning: historical perspective, Use cases, Quantitative image analysis, computer aided detection and diagnosis, triage, image registration,

**UNIT IV:**

**Radiomics:** radiology meets big data, application beyond image interpretation, application beyond radiology: histopathology

**Case Studies:** Carotid Intima-media segmentation, CAD in CT Colonography, Case Study : CAD in mammography and digital breast tomosynthesis, Diabetic Retinopathy

**UNIT V:**

**Software as a medical device (SaMD):** Clinical validation of SaMD, Data Collection: Factors affecting performance, training and testing datasets, performance assessment of CAD Devices, reference standard, mark-labeling criteria, performance metrics, clinical validation of imaging biomarkers and radiomics, Establishing clinical utility for AI application.

**Textbook:**

1. Artificial Intelligence in Medical Imaging From Theory to Clinical Practice, Lia Morra Silvia Delsanto Loredana Corraeale, CRC Press Edition one.
2. Radiology Fundamentals Introduction to Imaging & Technology, Harjit Singh, Springer Fourth Edition.

**Reference Textbook:**

1. Artificial Intelligence In Medical Imaging Opportunities Applications And Risks (Pb 2019) by RANSCHAERT E.R., SPRINGER



2. Advancement of Artificial Intelligence in Healthcare Engineering 2020 Edition by IGI Global, IGI Global

### **Course Outcomes**

The student shall be able to

1. Explain different type of Medical Imaging
2. Train Neural Networks for Medical Images
3. Apply AI in Medical Imaging
4. Understand Radiomics and CAD
5. Software as a medical device and Establishing clinical utility for AI application

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**(A36625) Artificial Intelligence in Gaming**  
**(Professional Elective-VI)**

**B.Tech CSE(AI&ML)VIII SEM**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**UNIT I:**

use of AI to play games, Playing to win in the player role, playing to win in a non-player role, experience in the player role, summary of AI game-playing goals and roles

**Game Design and AI design consideration:** Characteristics of games, characteristics of AI algorithm design.

**UNIT II:**

**Approaches of AI to play games:** Planning-base approaches, reinforcement learning, supervised learning, chimeric game players

**Types of Games played by AI:** board games, card games, arcade games, strategy games, racing games, shooter and other first-person games, serious games, Interactive games. Case Study:Pac-Man

**UNIT III:**

**Generating Content:** Taxonomy, methods for generating content: search-based method, sover-based method, grammar-based method, noise and fractals, machine learning, Roles of PCG in games. **Types of content:** Levels and maps, visuals, audio, narrative, rules and mechanic, game, Case Study: Maze generation.

**UNIT IV:**

Modeling Players- Model based approaches, hybrid model

**Input of the models:** Gameplay, objective, game context, player profile, linked data, Modeling behaviour, modeling experience, no output, **Types of models:** Player behavior, player experience.

**UNIT V:**

**Game AI panorama:** Panoramic views of Game AI, methods perspective, end user perspective, player-game interaction perspective, communication of AI with gamesGeneral play of AI, game generation and orchestration, affective loop, AI in other roles in games, ethical consideration.

**Text book:**

1. Artificial Intelligence and Games. Georgios N. Yannakakis and Julian Togelius , Springer

**Reference book:**

1. Artificial Intelligence for Games Second Edition, Ian John funge and Morgan Kaufmann publication

**Course Outcomes**

The student shall be able to

1. Use AI in Games and design games with help of AI
2. Explain Approaches of AI to play games and games play by AI
3. Explain Taxonomy, methods for generating content
4. Explain Modeling Players and Input of the models
5. Understand Panoramic views of Game AI and AI in other roles in games

**(A36626) Artificial Intelligence in Blockchain**  
**(Professional Elective-VI)**

**B.Tech CSE(AI&ML)VIII SEM**

<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
3	0	0	3

**UNIT -I:**

**Introduction to Blockchain :**Blockchain Introduction, history of blockchain, other technologies spawned from blockchain, mechanism behind blockchain, limitations and challenges of blockchain.

**Applications of Blockchain :**Demystifying the blockchain, uses of blockchain, new components of blockchain, challenges in the use of blockchain technology, more applications of blockchain technology

**UNIT –II**

**Blockchain Consensus:** Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate

**UNIT –III**

**Blockchain and cryptocurrency:** Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

**UNIT –IV**

**AI in Blockchain:** The Blockchain as a Path to Artificial Intelligence, data collection, cleaning, and processing in AI modelling, Smart Contract Advocates on Behalf of Digital Intelligence, Hyperledger

**Blockchain implementation :**Naive Blockchain construction, Memory Hard algorithm - Hashcash implementation

**UNIT –V**

**Ethereum :** Direct Acyclic Graph, Play with Go-ethereum, Smart Contract Construction, Toy application using Blockchain, Mining puzzles

**Text Book (s)**

1. Blockchain for Beginners: The Complete Step by Step Guide to Understanding Blockchain Technology, Mark Watney, 2017
2. Blockchain: Step-By- Step Guide to Understanding and Implementing Blockchain Technology, Paul Laurence, 2018

**Reference Books**

1. Ganesh Prasad Kumble , —Hands-On Artificial Intelligence for Blockchain: Converging Blockchain and AI to build smart applications for new economies| 2020
2. Kiran Garimella, Peter Fingar, Vint Cerf, —AI + Blockchain| 2018
3. Stein Smith, Sean , Blockchain, Artificial Intelligence and Financial Services Implications and Applications for Finance and Accounting Professionals, Springer, 2020

**Course Outcomes**

The student shall be able to

1. Understand blockchain, it's limitation, challenges and it's application
2. Explain Blockchain Consensus
3. Explain cryptocurrency and attacks
4. Explain AI in Blockchain and data collection, cleaning, and processing in AI modelling
5. Explain Ethereum and application using blockchain

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