

The following Programs and course contents having element of field projects / research projects / internships as approved by BOS.

Si.No	Program Name
1	B.Tech in Aeronautical Engineering
2	B.Tech in Computer Science and Engineering
3	B.Tech in Computer Science and Information Technology
4	B.Tech in Computer Science and Engineering (Cyber Security)
5	B.Tech in Computer Science and Engineering (Data Science)
6	B.Tech in Computer Science and Engineering (Artificial Intelligence and Machine Learning)
7	B.Tech in Electronics and Communication Engineering
8	B.Tech in Electrical and Electronics Engineering
9	B.Tech in Information Technology
10	B.Tech in Mechanical Engineering
11	M.Tech in Aerospace Engineering
12	M.Tech Computer Science and Engineering
13	M.Tech in Embedded Systems
14	M.Tech Thermal Engineering
15	MBA

ACADEMIC REGULATIONS

R22

Bachelor of Technology (B.Tech)

**B. Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2022-2023)
&
(For batches admitted Lateral Entry Scheme from the
academic year 2023-2024)**



**MARRI
LAXMAN
REDDY**

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ACADEMIC REGULATIONS (R22)

**B. Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2022-23)**

1.0 For pursuing four year Under Graduate Degree Programme of study in Engineering & Technology (UGP in E&T) offered by MLR Institute of Technology under Autonomous status is herein referred to as MLRIT (Autonomous):

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2022-23 onwards. Any reference to “Institute” or “College” in these rules and regulations shall stand for M L R Institute of Technology (Autonomous).

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, M L R Institute of Technology shall be the chairman Academic Council.

2.0 Eligibility for Admission

2.1 Admission to the undergraduate(UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAMCET) or the College or on the basis of any other order of merit approved by the University/TSHE, subject to reservations as prescribed by the government from time to time.

2.2 The medium of instructions for the entire undergraduate programme in Engineering & Technology will be **English** only.

3.0 B.Tech. Programme Structure

3.1 A student after securing admission shall complete the B.Tech. programme in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech course. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the undergraduate programme and award of the B.Tech. degree.

3.2 UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

3.2.1 Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each and in each semester - ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’ under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum/course structure suggested by AICTE are followed.

3.2.2 Credit Courses

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

- One credit for one hour/ week/ semester for Theory/ Lecture (L) courses or Tutorials.
- One credit for two hours/ week/ semester for Laboratory/ Practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

All subjects/ courses offered for the undergraduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The College has followed almost all the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS–Basic Sciences	Includes Mathematics, Physics and Chemistry Subjects.
2		ES-Engineering Sciences	Includes Fundamental Engineering Subjects.
3		HS–Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management.
4	Core Courses (CoC)	PC–Professional Core.	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Elective Courses (ElC)	PE–Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6		OE–Open Electives	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.
7	Core Courses	Project Work	B.Tech. Project or UG Project or UG Major Project or Project Stage I & II.
8		Industry Training/ Internship / Industry Oriented Mini- project/ Mini- Project/ Skill Development Courses.	Industry Training/ Internship/ Industry Oriented Mini-Project/ Mini-Project/ Skill Development Courses.
9		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Minor Courses	-	1 or 2 Credit Courses (subset of HS)
11	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)

4.0 Course Registration

- 4.1 A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.
- 4.2 The academic section of the college invites 'registration forms' from students before the beginning of the semester through 'on-line registration', 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'**.
- 4.3 A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor/counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor/ Counselor and the student.
- 4.4 A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA/ CGPA, and completion of the '**pre-requisites**' as indicated for various subjects/ courses, in the department course structure and syllabus contents.
- 4.5 Choice for '**additional subjects/ courses**', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Mentor/HOD.
- 4.6 If the student submits ambiguous choices or multiple options or erroneous entries during **on-line** registration for the subject(s) / course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.
- 4.7 Subject/ course options exercised through **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within a **week** after the commencement of class-work for that semester.
- 4.8 Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.
- 4.9 **Open Electives:** The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

4.10 Professional Electives: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

5.0 Subjects/ courses to be offered

5.1 A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.

5.2 More than **one faculty member** may offer the **same subject** (lab/ practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice for students will be based on - '**first come first serve** basis and CGPA criterion' (i.e. the first focus shall be on early **on-line entry** from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

5.3 If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject/ course for **two (or multiple) sections**.

5.4 In case of options coming from students of other departments/ branches/ disciplines (not considering **open electives**), first **priority** shall be given to the student of the '**parent department**'.

6.0 Attendance requirements:

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects/ courses (including attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab) for that semester. **Two periods** of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject.

6.2 Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3 A stipulated fee shall be payable for condoning of shortage of attendance.

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

6.5 **Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled**, including all academic credentials (internal marks etc.) of that semester. **They will not be promoted to the next semester.** They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in Item No. 6.

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 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 'C' grade or above in that subject/ course.

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Industry Oriented Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

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

7.3 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to Second year first semester	(i) Regular course of study of first year second semester. (ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester to Second year second semester	Regular course of study of second year first semester.
4	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to Third year second semester	Regular course of study of third year first semester.

6	Third year second semester to Fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester.

- 7.4** A student (i) shall register for all courses/subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA ≥ 5.0 (in each semester), and CGPA ≥ 5 (at the end of 8 semesters), (iv) **passes all the mandatory courses**, to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA (**at the end of undergraduate programme**), and shall be indicated in the grade card / marks memo of IV-year II semester.
- 7.5** If a student registers for ‘**extra subjects**’ (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 ‘**extra subjects**’ (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such ‘**extra subjects**’ registered, percentage of marks and letter grade alone will be indicated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items 6 and 7.1 – 7.4 above.
- 7.6** A student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (thereby failing to secure ‘**C**’ grade or above) may reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.
- 7.7** A student **detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements**. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.
- 7.8** A student **detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits**. The academic regulations under which the student has been readmitted shall be applicable to him.

8.0 Evaluation - Distribution and Weightage of Marks

8.1 The performance of a student in every subject/course (including practical and Project Stage – I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination).

8.2 In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 20 marks with a total duration of 2 hours as follows:

1. Mid Term Examination for 30 marks:
 - a. Part - A : Objective/quiz paper for 10 marks.
 - b. Part - B : Descriptive paper for 20 marks.

The objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks. The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The **average of the two Mid Term Examinations** shall be taken as the final marks for Mid Term Examination (for 30 marks).

The remaining 10 marks of Continuous Internal Evaluation are distributed as:

2. Assignment for 5 marks. (**Average of 2 Assignments** each for 5 marks)
3. Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks.

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Over all 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores $\geq 35\%$ (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled in spite of appearing the SEE.

There is NO Computer Based Test (CBT) for R22 regulations.

The details of the end semester question paper pattern are as follows:

- 8.2.1** The semester end examinations (SEE), for theory subjects, will be conducted for 60 marks consisting of two parts viz. i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.
- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
 - Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.
 - The duration of Semester End Examination is 3 hours.
- 8.3** For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:
1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks
 2. **10 marks for viva-voce** (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
 3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
 4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the other colleges which will be decided by the principal of the College.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
 2. 15 for experiment/program
 3. 15 for evaluation of results
 4. 10 marks for presentation on another experiment/program in the same laboratory course and
 5. 10 marks for viva-voce on concerned laboratory course.
- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Over all 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores $\geq 35\%$ (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned

subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

8.4 The evaluation of courses having ONLY internal marks in I Year I Semester and II Year II Semester is as follows:

1. I Year I,II Semester course (*ex., Elements of CE/ME/EEE/ECE/CSE/Seminar & Non Credit Mandatory Courses*): The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two MID-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course. Seminar evaluation conducted through day to day evaluation of the students in presentation/abstract.

For CSE/IT and allied branches the Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts i) **Part – A** for 20 marks, ii) **Part – B** for 20 marks with a total duration of 2 hours.

Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks. **Part B:** Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce/PPT/Poster Presentation/ Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

For all other branches, the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

- a) A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks
 - b) **10 marks for viva-voce** (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
 - c) Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 15 marks.
 - d) The remaining 15 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.
2. **II Year II Semester Real-Time (or) Field-based Research Project** course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a

presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

- 8.5** There shall be an Industry training (or) Internship (or) Industry oriented Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Industry Oriented Mini Project (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be **NO internal marks** for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project.
- 8.6** The UG research project shall be initiated at the end of the IV Year I Semester and the duration of the project work is one semester. The student must present Project Stage – I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his research project work.
- 8.7** UG research project work shall be carried out in two stages: Research Project Stage–I for approval of project before Mid-II examinations in IV Year I Semester and Research Project Stage – II during IV Year II Semester. Student has to submit research project work report at the end of IV Year II Semester. The research project shall be evaluated for 100 marks before commencement of SEETheory examinations.
- 8.8** For Research Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Research Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule.
- A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such ‘one reappearace’ evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.
- 8.9** For Research Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20marks and Project Supervisor shall evaluate for 20 marks. The topics for Industry Oriented Mini

Project/ Internship/SDC etc. and the research Project shall be different from the topic already taken. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

For conducting viva-voce of project, Principal/COE selects an external examiner from the list of experts in the relevant branch submitted by the Principal of the College.

A student who has failed, may reappear once for the above evaluation, when it is scheduled again; if student fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.10 A student shall be given only one time chance to re-register for a maximum of two subjects in a semester:

- If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Viva- voce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork in next academic year.

In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

8.11 *For mandatory non-credit Audit courses*, The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two MID-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

8.12 For Mandatory Non-Credit Courses offered in a Semester, after securing $\geq 65\%$ attendance and has secured not less than 40% of marks in the Total. Then the student is **PASS** and will be qualified for the award of the degree. No marks or Letter Grade shall be allotted for these courses/activities. However, for non credit courses '**Satisfactory**' or '**Unsatisfactory**' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

9.0 Grading Procedure

9.1 Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/Practicals/ Industry-Oriented Mini Project/Internship/SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

9.2 As a measure of the performance of a student, a 10-point absolute grading system using the

following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

- 9.3** A student who has obtained an ‘F’ grade in any subject shall be deemed to have ‘failed’ and is required to reappear as a ‘supplementary student’ in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.
- 9.4** To a student who has not appeared for an examination in any subject, ‘Ab’ grade will be allocated in that subject, and he is deemed to have ‘Failed’. A student will be required to reappear as a ‘supplementary student’ in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.
- 9.5** A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.
- 9.6** A student earns Grade Point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding ‘Credit Points’ (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit Points (CP) = Grade Point (GP) x Credits For a course

- 9.7** A student passes the subject/ course only when $GP \geq 5$ (‘C’ grade or above)
- 9.8** The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects/ courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

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

where ‘i’ is the subject indicator index (considering all subjects in a semester), ‘N’ is the no. of subjects ‘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^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

- 9.9** The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses (of 160) 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 II semester onwards at the end of each semester as per the formula

$$\text{CGPA} = \{ \sum_{j=1}^M C_j G_j \} / \{ \sum_{j=1}^M C_j \} \dots \text{for all } S \text{ Semesters registered}$$

(i.e., up to and inclusive of S Semesters, $S \geq 2$),

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards up to and inclusive of the Semester S (obviously $M > N$), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C_j is the no. of Credits allotted to the jth Subject, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. 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.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

$$\text{SGPA} = 152/21 = 7.24$$

Illustration of Calculation of CGPA up to 3rd Semester:

Semester	Course/Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30

III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	69		Total Credit Points	518

$$\text{CGPA} = 518/69 = 7.51$$

The calculation process of CGPA illustrated above will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. programme.

- 9.10** For merit ranking or comparison purposes or any other listing, **only the ‘rounded off’** values of the CGPAs will be used.
- 9.11** SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0 Passing Standards

- 10.1** A student shall be declared successful or ‘passed’ in a semester, if he secures a GP ≥ 5 (‘C’ grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or ‘passed’ in the entire undergraduate programme, only when gets a CGPA ≥ 5.00 (‘C’ grade or above) for the award of the degree as required.
- 10.2** After the completion of each semester, a grade card or grade sheet 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.) and credits earned. **There is NO exemption of credits in any case.**

11.0 Declaration of results

- 11.1** Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.
- 11.2** For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

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

12.0 Award of Degree

- 12.1** A student who registers for all the specified subjects/ courses as listed in the course

structure and secures the required number of 160 credits (with CGPA ≥ 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 B.Tech. degree in the branch of Engineering selected at the time of admission.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 A student with final CGPA (at the end of the undergraduate programme) > 8.00 , and fulfilling the following conditions - shall be placed in '**First Class with Distinction**'. However, he

- (i) Should have passed all the subjects/courses in '**First Appearance**' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.
- (ii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA > 8 shall be placed in '**First Class**'.

12.4 Students with final CGPA (at the end of the undergraduate programme) ≥ 7.0 but < 8.00 shall be placed in '**First Class**'.

12.5 Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00 , shall be placed in '**Second Class**'.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6 , shall be placed in '**pass class**'.

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

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

12.9 Award of 2-Year B.Tech. Diploma Certificate

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (with in 4 years from the date of admission) upto B. Tech. – II Year – II Semester, if the student want to exit the 4-Year B. Tech. program. The student **once opted and awarded for 2-Year UG Diploma Certificate, the student will not be permitted to join** in B. Tech. III Year – I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree.
2. A student may be permitted to take one year break after completion of II Year – II Semester or B. Tech. – III Year – II Semester (with Principal permission through the HOD of the department well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0 Withholding of results

- 13.1** If the student has not paid the fees to the College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student 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.

14.0 Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of R18 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech./B. Pharmacy programme within the stipulated period of eight academic years from the date of first admission in I Year.
2. A student who has been detained in any semester of II, III and IV years of R18 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech./B. Pharmacy within the stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.
3. For students detained due to shortage of credits: A student of MLR18 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of R22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both MLR18 & R22 regulations. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

B. For readmitted students in R22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case.**
6. If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the Concerned BOS.

15.0 Student Transfers

- 15.1** There shall be no branch transfers after the completion of admission process.
- 15.2** There shall be no transfers from one college/stream to another within the constituent colleges and units of Jawaharlal Nehru Technological University Hyderabad.
- 15.3** The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the students have not studied at the earlier institution. Further, though the students have passed some of the

subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the students have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

- 15.4** The transferred students from other Universities/Institutions to College who are on rolls are to be provided one chance to write the CBT (for internal marks) in the **equivalent subject(s)** as per the clearance letter issued by the University.
- 15.5** The college have to provide one chance to write the internal examinations in the **equivalent subject(s)** to the students transferred from other universities/institutions to JNTUH autonomous affiliated colleges who are on rolls, as per the clearance (equivalence) letter issued by the University.

16.0 Malpractice Prevention Committee

A malpractice prevention committee shall be constituted to examine and punish the students who involve in malpractice / indiscipline in examinations. The committee shall consist of:

- a) Controller of examinations - Chairman
- b) Addl. Controller of examinations.- Member Convener
- c) Subject expert - member
- d) Head of the department of which the student belongs to. - Member
- e) The invigilator concerned - member

The committee shall conduct the meeting after taking explanation of the student and punishment will be awarded by following the malpractice rules meticulously.

Any action on the part of candidate at the examination like trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations, in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and will be recommended for appropriate punishment after thorough enquiry.

17.0 Scope

- 17.1** The academic regulations should be read as a whole, for the purpose of any interpretation.
- 17.2** In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of Academic Council is final.
- 17.3** 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.
- 17.4** Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME)
FROM THE AY 2023-24

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

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

2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech. programme (LES) for the award of B.Tech. degree.
3. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.
4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5. Promotion rule

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	i) Regular course of study of third year second semester. ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

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

7. LES students are not eligible for 2-Year B. Tech. Diploma Certificate.

Malpractices Rules

Disciplinary Action For / Improper Conduct in Examinations

	Nature of Malpractices/ Improper conduct	Punishment
	If the student:	
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 student is appearing but has not made use of (material shall include any marks on the body of the student 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 student orally or by any other body language methods or communicates through cell phones with any student 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 students 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 student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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 student is to be cancelled
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student 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 student is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the student 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 in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student 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 student is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the student 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/COE/ACoE/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	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 student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears off 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 student 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 student is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.

8.	Possesses 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 student 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 student is also debarred and forfeits the seat.
9.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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 student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the 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 student has already appeared for including practical examinations and project work and shall not be permitted for the 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 student has appeared for including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal for further action to award a suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the students as per the above guidelines.
2. Punishment for staff: (if the squad reports that the staff is also involved in encouraging malpractices)
 - a. A show-cause notice shall be issued to the staff.
 - b. Impose a suitable fine on the staff.

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ACADEMIC REGULATIONS
COURSE STRUCTURE & DETAILED SYLLABUS
CHOICE BASED CREDIT SYSTEM
R22

Bachelor of Technology (B.Tech)

Aeronautical Engineering

B. Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2022-2023)
&
(For batches admitted Lateral Entry Scheme from the
academic year 2023-2024)



MLR Institute of Technology

(Autonomous)

Laxman Reddy Avenue, Dundigal

Hyderabad – 500043, Telangana State

www.mlrinstitutions.ac.in, Email: director@mlrinstitutions.ac.in

COURSE STRUCTURE B. TECH – Aeronautical Engineering

REGULATIONS: R22

I YEAR I SEMESTER									
Induction program for one weeks									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	0	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	0	4	40	60	100
A6HS01	English for Skill Enhancement	HSMC	3	0	0	3	40	60	100
A6ME01	Engineering Graphics	ESC	1	0	4	3	40	60	100
A6BS08	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A6HS02	English Language and Communication Skills Lab	HSMC	0	0	3	1.5	40	60	100
A6ME03	Engineering workshop Practices	ESC	0	1	2	2	40	60	100
A6HS04	Seminar	HSMC	0	0	2	1	50	--	50
TOTAL			13	3	14	20	330	420	750
I YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	0	4	40	60	100
A6BS09	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A6ME05	Engineering Mechanics	ESC	4	0	0	4	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A6AE01	Elements of Aeronautical Engineering	ESC	0	0	3	2	40	60	100
A6BS10	Engineering Chemistry Lab	BSC	1	0	2	1.5	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	0	0	3	1.5	40	60	100
A6BS11	Environmental Science	MC	2	0	0	0	50	--	50
TOTAL			16	2	8	20	320	420	750

Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6AE02	Airplane Performance	PCC	3	-	-	3	40	60	100
A6AE03	Solid Mechanics for Aeronautics	PCC	3	-	-	3	40	60	100
A6AE04	Aerodynamics	PCC	3	-	-	3	40	60	100
A6AE05	Aero Thermodynamics	ESC	3	1	-	4	40	60	100
A6EE60	Basic Electrical and Electronics Engineering	ESC	3	-	-	3	40	60	100
A6AE06	Solid Mechanics for Aeronautics Lab	ESC	-	-	3	1.5	40	60	100
A6EE61	Basic Electrical and Electronics Engineering Lab	ESC	-	-	2	1	40	60	100
A6AE07	Aerodynamics Lab	PCC	-	-	3	1.5	40	60	100
TOTAL			15	1	8	20	320	480	800
Mandatory Course (Non-Credit)									
A6HS06	Constitution of India	HSMC	2	-	-	-	50	-	50

B. Tech.- IV-Semester

Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6AE08	IoT Based Drone Systems	ESC	3	-	-	3	40	60	100
A6AE09	Aerospace Propulsion	PCC	3	-	-	3	40	60	100
A6AE10	Aerospace Structures	PCC	3	-	-	3	40	60	100
A6BS05	Probability, Statistics and Complex Analysis	BSC	3	1	-	4	40	60	100
A6AE11	Flight Simulation and Propulsion Lab	PCC	-	-	3	1.5	40	60	100
A6AE61	IOT Lab	ESC	-	-	2	1	40	60	100
A6AE12	Aircraft Interior Design Lab	PCC	-	-	3	1.5	40	60	100
A6AE13	Python Computing Lab	ESC	-	-	2	1	40	60	100
A6AE14	Real-Time /Field-Based Project	PWC	-	-	4	2	50	-	50
TOTAL			12	1	14	20	370	480	850
Mandatory Course (Non-Credit)									
A6HS05	Gender Sensitization	HSMC	-	-	2	-	50	-	50

B. Tech-V-Semester

Course Code	Course Title		Hours per Week	Credits	Scheme of Examination Maximum Marks
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		Category	L	T	P		CIE	SEE	Total
A6AE15	Smart Aerospace Structures	PCC	3	-	-	3	40	60	100
A6AE16	AI for Aerodynamics	PCC	3	1	-	4	40	60	100
A6AE17	Aircraft Stability and Control	PCC	3	-	-	3	40	60	100
A6AE18	Aircraft Production Technology	ESC	3	-	-	3	40	60	100
	OPEN ELECTIVE - I	OEC	3	-	-	3	40	60	100
A6AE21	Aerospace Structures Lab	PCC	-	-	3	1.5	40	60	100
A6AE22	Aircraft Production Technology Lab	ESC	-	-	3	1.5	40	60	100
A6AE62	MOOCs / Independent Study	PWC	-	-	2	1	-	100	100
TOTAL			15	1	8	20	280	520	800
Mandatory Course (Non-Credit)									
A6HS10	Human Values and Professional Ethics	HSMC	2	-	-	-	50	-	100

B. Tech.- VI-Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6AE23	UAV Design	PCC	3	-	-	3	40	60	100
A6AE24	Air Transportation System	PCC	3	-	-	3	40	60	100
	OPEN ELECTIVE-II	OEC	3	-	-	3	40	60	100
	PROFESSIONAL ELECTIVE - I	PEC	3	-	-	3	40	60	100
	PROFESSIONALELECTIVE - II	PEC	3	-	-	3	40	60	100
A6AE35	UAV Design Lab	PCC	-	-	3	1.5	40	60	100
A6AE36	Computational Structural Analysis Lab	PCC	-	-	3	1.5	40	60	100
A6AE37	Industry oriented Mini project/ internship	PWC	-	-	4	2	-	100	100
TOTAL			15	-	10	20	280	520	800
Mandatory Course (Non-Credit) For Lateral Entry Students									
A6BS11	Environmental science		2	-	-	-	50	-	50
B. Tech.-VII-Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		

			L	T	P		CIE	SEE	Total
A6AE38	Composite Materials	PCC	3	-	-	3	40	60	100
A6AE39	Computational Fluid Dynamics	PCC	3	-	-	3	40	60	100
	OPEN ELECTIVE-III	OEC	3	-	-	3	40	60	100
	PROFESSIONAL ELECTIVE - III	PEC	3	-	-	3	40	60	100
	PROFESSIONAL ELECTIVE - IV	PEC	3	-	-	3	40	60	100
A6AE50	Composites and Analysis Lab	PCC	-	-	3	1.5	40	60	100
A6AE51	Computational Fluid Dynamics Lab	PCC	-	-	3	1.5	40	60	100
A6AE52	Research Project Phase-I	PWC	-	-	4	2	100	--	100
TOTAL			15	-	10	20	380	420	800

B.Tech.- VIII-Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6HS12	Management Science	HSMC	3	-	-	3	40	60	100
	PROFESSIONAL ELECTIVE – V	PEC	3	-	-	3	40	60	100
	PROFESSIONAL ELECTIVE– VI	PEC	3	-	-	3	40	60	100
A6AE61	Research Project Phase-II	PWC	-	-	22	11	40	60	100
TOTAL			9	-	22	20	160	240	400

PROFESSIONAL ELECTIVES			
PE-I		PE-II	
A6AE27	Vibration and Structural Dynamics	A6AE31	Computer Integrated Manufacturing
A6AE28	Experimental Stress Analysis	A6AE32	Aero Engine Repair and Maintenance
A6AE29	Fatigue and Fracture Mechanics	A6AE33	Mechanisms and Machine Design
A6AE30	Finite Element Analysis	A6AE34	Geometric Dimensions and Tolerance
PE-III		PE-IV	
A6AE42	Helicopter Engineering	A6AE46	Deep Learning in Flight Vehicle
A6AE43	Aero Elasticity	A6AE47	Industry 4.0
A6AE44	Avionics	A6AE48	AI&ML for UAV
A6AE45	Industrial Aerodynamics	A6AE49	3D Printing
PE-V		PE-VI	
A6AE53	Fundamentals of Combustion	A6AE57	Flight Scheduling and Operations
A6AE54	Rocket and Missiles	A6AE58	Aircraft systems and Instruments
A6AE55	Space Mechanics	A6AE59	Airframe Maintenance and Repair
A6AE56	Advanced Propulsion	A6AE60	Air Traffic Control and Aerodrome Design

OPEN ELECTIVE COURSES

OPEN ELECTIVE COURSE-I			
S. No.	Course Code	Course Name	Offering Department
1.	A6AE19	Fundamentals of Avionics	Aeronautical Engineering
2.	A6AE20	Introduction to Aerospace Technology	

OPEN ELECTIVE COURSE-II			
S. No.	Course Code	Course Name	Offering Department
1.	A6AE25	Introduction to Jets and Rockets	Aeronautical Engineering
2.	A6AE26	Non-Destructive Testing Methods	

OPEN ELECTIVE COURSE-III			
S. No.	Course Code	Course Name	Offering Department
1.	A6AE40	Introduction to Aircraft Industry	Aeronautical Engineering
2.	A6AE41	Unmanned Aerial Vehicles	

ACADEMIC REGULATIONS AND COURSE STRUCTURE

CHOICE BASED CREDIT SYSTEM

AR22

COMPUTER SCIENCE & ENGINEERING

for

Bachelor of Technology (B.Tech)

B. Tech. - Regular Four Year Degree Programme

(For batches admitted from the academic year 2022 - 2023)



MLR Institute of Technology

(Autonomous)

Laxman Reddy Avenue, Dundigal
Hyderabad – 500043, Telangana State

www.mlrinstitutions.ac.in, Email: director@mlrinstitutions.ac.in

Course Structure

B. TECH – Computer Science and Engineering

Regulations: AR22

I B.Tech.- I Semester									
Induction program for one weeks									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	0	4	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A6HS01	English for Skill Enhancement	HSMC	3	0	0	3	40	60	100
A6EE60	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60	100
A6EC03	Electronic Devices and Applications	ESC	2	0	0	2	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	0	0	3	1.5	40	60	100
A6HS02	English Language and Communication Skills Lab	HSMC	0	0	3	1.5	40	60	100
A6EC04	Introduction to Internet of Things	ESC	0	0	2	1	40	60	100
A6HS04	Seminar	HSMC	0	0	2	1	100	0	100
TOTAL			14	1	10	20	420	480	900
I B.Tech.- II Semester									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	0	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	0	4	40	60	100
A6BS09	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A6ME02	Engineering Drawing	ESC	1	0	3	2.5	40	60	100
A6BS08	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A6CS04	Python Programming Lab	ESC	0	0	3	1.5	40	60	100
A6ME04	Engineering Work Shop	ESC	0	0	3	1.5	40	60	100
A6CS01	Elements of Computer Science and Engineering	HSMC	0	0	2	1	100	0	100
A6BS11	Environmental Science	MC	2	0	0	0	50	0	50
TOTAL			12	3	14	20	430	420	850

II B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS03	Computer Oriented Statistical Methods	BSC	3	1	-	4	40	60	100
A6CS28	Digital Electronics and Computer Organization	ESC	3	-	-	3	40	60	100
A6CS05	Data Structures	ESC	3	-	-	3	40	60	100
A6IT02	Object Oriented Programming using JAVA	PCC	3	-	-	3	40	60	100
A6CS07	Software Engineering	PCC	3	-	-	3	40	60	100
A6CS06	Data Structures Lab	ESC	-	-	3	1.5	40	60	100
A6IT03	Object Oriented Programming using JAVA Lab	PCC	-	-	3	1.5	40	60	100
A6CS52	Skill Development (Data Visualization using R)	SKL	0	0	2	1	0	100	100
A6HS05	Gender Sensitization	MC	2	-	-	0	50	0	50
Total			17	01	8	20	330	520	850

II B.Tech.- II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6CS08	Discrete Mathematics	BSC	3	-	-	3	40	60	100
A6HS08	Business Economics and Financial Analysis	HSMC	3	-	-	3	40	60	100
A6CS09	Database Management Systems	PCC	3	-	-	3	40	60	100
A6CS11	Operating System	PCC	3	-	-	3	40	60	100
A6CS13	Software Testing Fundamentals	PCC	3	-	-	3	40	60	100
A6CS10	Database Management Systems Lab	PCC	-	-	3	1.5	40	60	100
A6CS12	Operating System Lab	PCC	-	-	3	1.5	40	60	100
A6CS14	Real Time Research Project / Societal Relevant Project	PWC	-	-	2	1	50	0	50
A6CS53	Skill Development (HTML, XML, Javascript, NodeJS / Mobile Application)	SKL	0	0	2	1	0	100	100
A6HS06	Constitution of India	MC	2	-	-	0	50	0	50
Total			17	00	10	20	380	520	900

III B.Tech.- I SEMESTER									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6CS15	Design and Analysis of Algorithms	PCC	3	-	-	3	40	60	100
A6CS16	Data Mining and Machine Learning	PCC	3	-	-	3	40	60	100
A6CS18	Computer Networks	PCC	3	-	-	3	40	60	100
PCC	Professional Elective - I	PEC	3	-	-	3	40	60	100
PCC	Professional Elective - II	PEC	3	-	-	3	40	60	100
A6CS19	Computer Networks Lab	PCC	-	-	3	1.5	40	60	100
A6CS17	Data Mining and Machine Learning Lab	PCC	-	-	3	1.5	40	60	100
A6HS03	Advanced Communication Skills Lab	HSMC	-	-	2	1	40	60	100
A6CS54	Independent Study /MOOCS/NPTEL	PWC	0	0	2	1	0	100	100
A6HS10	Human Values & Professional Ethics	MC	2	-	-	0	50	0	50
Total			17	0	10	20	370	580	950

III B.Tech.- II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6AI02	Artificial Intelligence	PCC	3	-	-	3	40	60	100
A6CS20	Automata Theory and Compiler Design	PCC	3	-	-	3	40	60	100
A6IT13	Cloud and Devops	PCC	3	-	-	3	40	60	100
PCC	Professional Elective - III	PEC	3	-	-	3	40	60	100
OEC	Open Elective - I	OEC	3	-	-	3	40	60	100
PCC	Professional Elective III - Lab	PEC	-	-	3	1.5	40	60	100
A6IT16	Cloud and Devops Lab	PCC	-	-	3	1.5	40	60	100
A6CS21	Industry Oriented Mini Project / Internship	PWC	-	-	4	2	0	100	100
A6BS11	Environmental Science(only for Lateral Entry Students)	ES	2	-	-	-	50	0	50
Total			17	0	10	20	330	520	850

IV B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6CS22	Distributed Computing	PCC	3	-	-	3	40	60	100
A6CS23	Cryptography and Network Security	PCC	3	-	-	3	40	60	100
PCC	Professional Elective - IV	PEC	3	-	-	3	40	60	100
PCC	Professional Elective - V	PEC	3	-	-	3	40	60	100
OEC	Open Elective II	OEC	3	-	-	3	40	60	100
A6CS24	Cryptography and Network Security Lab	PCC	-	-	3	1.5	40	60	100
A6CS25	Research Project Phase - 1	PWC	-	-	7	3.5	100	0	100
Total			15	0	10	20	340	360	700

IV B.Tech. - II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
PCC	Professional Elective - VI	PEC	3	-	-	3	40	60	100
OEC	Open Elective III	OEC	3	-	-	3	40	60	100
A6CS26	Industry Specific Training / Internship / Technical Paper	PWC	-	-	4	2	40	60	100
A6HS15	Organizational Behaviour	HSMC	-	-	2	1	40	60	100
A6CS27	Major Project Phase - 2	PWC	-	-	22	11	40	60	100
Total			06	-	28	20	200	300	500

SEM	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	20	20	20	20	20	20	20	160

*Environmental Studies have to be taken by LE in 2-1

**MC: Satisfactory / Non-Satisfactory

PROFESSIONAL ELECTIVES			
PE – I		PE – II	
A6IT23	Introduction to Data Science	A6CS43	Data Warehousing and Business Intelligence
A6IT29	Soft Computing	A6AI14	Natural Language Processing
A6CS29	Blockchain Technology & Web 3.0	A6CS30	Permissioned Blockchain – Hyper ledger
A6CS36	Cyber Security & Cyber laws	A6CY10	Ethical Hacking
A6IT26	Information Retrieval Systems	A6CS37	Semantic Web
PE – III		PE – IV	
A6CS44	Big Data Analytics	A6AI18	Knowledge Representation and Reasoning
A6AI17	Deep Learning	A6AI21	Cognitive Computing
A6CS31	Smart Contract Development and Audit	A6CS33	Blockchain Taxonomy & Crypto Currencies
A6CY16	Cyber Crime Investigation & Digital Forensics	A6CY13	Vulnerability Assessment and Penetration Testing
A6CS39	Image Processing Techniques	A6CS41	Speech and Video Processing
PE – V		PE – VI	
A6CS46	Web and Social Media Analytics	A6CS47	Nature Inspired computing for Data Science
A6CS63	Perception and Computer Vision	A6IT38	Human Computer Interaction
A6CS34	Block Chain for FinTech and Non FinTech	A6CS35	Financial Risk Management for Crypto currencies
A6CY50	Web & Database Security	A6CS38	Cloud Security
A6AI22	Augmented Reality & Virtual Reality	A6CS42	IoT Cloud Processing and Analytics
PE – III LAB			
A6CS45	Big Data Analytics Lab		
A6AI19	Deep Learning Lab		
A6CS32	Smart Contract Development and Audit Lab		
A6CY17	Cyber Crime Investigation & Digital Forensics Lab		
A6CS40	Image Processing Techniques Lab		

OPEN ELECTIVE COURSES

OPEN ELECTIVE - I			
S. No.	Course Code	Course Name	Offering Department
1	A6CS48	Software Project Management Fundamentals	Computer Science and Engineering
2	A6CS49	Data Analytics	
OPEN ELECTIVE - II			
S. No.	Course Code	Course Name	Offering Department
1	A6CS09	Database Management System	Computer Science and Engineering
2	A6CS50	Data Visualization Techniques	
OPEN ELECTIVE - III			
S. No.	Course Code	Course Name	Offering Department
1	A6CS51	Artificial Intelligence and Applications	Computer Science and Engineering
2	A6CS36	Cyber Security & Cyber laws	

Academic Guidelines

Professional Electives:

- Professional Electives are streamed to either Data Science / AIML / Block Chain / Cyber Security
- Students must choose the same stream in all Professional Electives.

Skill Development:

- Skill development courses will be conducted as practical hours and evaluated for one credit.

Summer Internship / Research Project in II-II semester

Summer Internship / Internship

- Student can either do internship from AICTE approved Internships or in any Industry.
- In case of Internship from Industry, two supervisors will be supporting the students.
Supervisors: 1. One Internal supervisor and 2. One Industry Personnel (External)
- Evaluation will be done in III-I

Rubrics - Internship

	Internal Supervisor	External Supervisor	Total
Marks	40 Mid – 20; Final 20;	60	100

Research Project:

- Student can carry out project with respect to research question.
- Students can carry out projects in team of three or individually.
- One supervisor per student / team will supervise a research project and the supervisor shall be internal supervisor or external supervisor from JNTU / IIIT / IIT.
- Evaluation will be done in III-I.

Rubrics

S.No.	Tasks	Marks	Review
1	Research Problem / Question	5	Review-I
2	Research Design	5	
3	Methodology	5	
4	Implementation	40	Review-II
5	Results and Discussion	20	Review-III
6	Deployment	10	
7	Publish / Patent	10	
8	Viva / Presentation	5	

Mini Project in III-II

Student can carry out mini project based on the courses learned in II and III years.

- Student can carry out project in guidance of a internal supervisor.
- Students can carry out projects in team of three or individually.
- One supervisor per student / team will supervise a project and the supervisor shall be internal supervisor.
- Evaluation will be done in III-II itself.

Massive Open Online Courses (MOOCs)

- Student can undergo one MOOC course from NPTEL / INFOSYS Springboard / any platform which permits credit transfer as per AICTE.
- It is purely self paced / self study course.

- c. Certificate should be produced by student to the department / exam cell for considering the credit at the end of semester.
- d. Evaluation will be done in III-II itself for 100%

Global Certification

- a. Student can undergo Global Certification on their own or in support of Placement cell or department.
- b. Student can choose a course in such way that the course must have minimum 40 hours of duration and certificate must be directly from company.
- c. Ex: Computer Networks and Security [CISCO], AWS Certification [AWS Academy]
- d. Evaluation will be done in III-II itself for 100%

I B.TECH I SEMESTER SYLLABUS

LINEAR ALGEBRA AND CALCULUS

I B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6BS01	BSC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100
Contact Classes: 44		Tutorial Classes: 08		Practical Classes: Nil			Total Classes: 52	

COURSE OBJECTIVES

To learn

1. Concept of Rank of a matrix, Consistency and solving system of linear equations.
2. Concept of eigen values, eigen vectors and diagonalization of the matrix.
3. The concept of differential equations and solve them using appropriate methods.
4. Evaluate multiple integrals and improper integrals
5. The partial derivatives of several variable functions.

COURSE OUTCOMES

at the end of the course, student will be able to:

1. Solve the system of linear equations using rank of the matrices.
2. Find the Eigen values and Eigen vectors of a matrix
3. Identify the different types of differential equations and solve them using appropriate methods.
4. Evaluate the improper integrals using beta and gamma functions.
5. Find the Maxima and Minima of several variable functions.

UNIT - I	MATRICES AND THEIR APPLICATIONS	CLASSES: 08
<p>Real matrices: Symmetric-skew-symmetric and orthogonal matrices –Complex matrices: Hermitian, Skew – Hermitian and Unitary matrices –Elementary row and column transformations –Elementary matrix-Finding rank of a matrix by reducing to Echelon form and Normal form-Finding the inverse of a matrix using elementary row/column transformations (Gauss-Jordan method)-Consistency of system of linear equations (homogeneous and non-homogeneous) using the rank of a matrix –Solving m n and n n linear system of equations by Gauss Elimination, Gauss siedel Method</p>		
UNIT - II	EIGEN VALUES, EIGEN VECTORS	CLASSES: 08
<p>Eigen values and Eigen vectors and its properties (without proof), Cayley-Hamilton theorem (Statement and verification)-Finding inverse and powers of a matrix by Cayley-Hamilton theorem, Diagonalization of matrices. Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to Canonical forms by Orthogonal Transformation.</p>		
UNIT - III	ORDINARY DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS	CLASSES: 10
<p>Introduction- Exact and reducible to Exact differential equations-Newton's Law of cooling-Law of Growth and Decay. Linear differential equations of second and higher order with constant coefficients - Non-Homogeneous term of the type $Q(x) = e^{ax}$, $\sin ax$, $\cos ax$, $e^{ax}v(x)$, $x^n v(x)$ - Method of variation of parameters L-C-R Circuits.</p>		
UNIT - IV	MULTIPLE INTEGRALS, BETA AND GAMMA FUNCTIONS	CLASSES: 10

Double and triple integrals (Cartesian and polar), Change of order of integration in double integrals, Change of variables (Cartesian to polar) in double integrals. Finding the area and volume of a region using double and triple integral.

Beta- Gamma Functions and their Properties-Relation between them- Evaluation of improper integrals using Gamma and Beta functions.

UNIT - V**CALCULUS OF SEVERAL VARIABLES****CLASSES: 08**

Limit, Continuity - Partial derivative- Partial derivatives of higher order -Total derivative - Chain rule, Jacobians- functional dependence & independence. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

TEXT BOOKS

1. Ervin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers, 36th Edition, 2010.

REFERENCE BOOKS

1. G.B.Thomas, calculus and analytical geometry, 9th Edition, Pearson Reprint 2006.
2. N.P.Bali and Manish Goyal ,A Text of Engineering Mathematics,Laxmi publications,2008.
3. E.L.Ince, Ordinary differential Equations,Dover publications,1958.

WEB REFERENCES

1. https://www.efunda.com/math/math_home/math.cfm
2. <https://www.ocw.mit.edu/resources/#Mathematics>
3. <https://www.sosmath.com/>
4. <https://www.mathworld.wolfram.com/>

E -TEXT BOOKS

1. <https://www.e-booksdirectory.com/details.php?ebook=10166>

MOOCS COURSE

1. <https://swayam.gov.in/>
2. <https://onlinecourses.nptel.ac.in/>

PROGRAMMING FOR PROBLEM SOLVING

I B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks			
		L	T	P		C	CIE	SEE	Total
A6CS02	ESC	3	0	0	3	40	60	100	
		Practical Classes: Nil			Total Classes: 64				
Contact Classes: 64		Tutorial Classes: Nil			Practical Classes: Nil			Total Classes: 64	

COURSE OBJECTIVES

1. To familiarize with the syntax and semantics of C programming language.
2. To learn the usage of structured programming approach in solving problems.
3. To use arrays, pointers, strings and structures in solving problems.
4. To understand how to solve problems related to matrices, Searching and sorting.
5. To understand how to use files to perform read and write operations.

COURSE OUTCOMES

1. Apply algorithmic thinking to understand, define and solve problems
2. Develop computer programs using programming constructs and control structures and to use arrays to develop C programs
3. Decompose a problem into functions to develop modular reusable code and to use pointers to solve complex problems.
4. Use Strings and structures to formulate algorithms and programs.
5. Use FILE to perform read and write operations.

UNIT - I

INTRODUCTION - PROBLEM SOLVING AND ALGORITHMIC THINKING & INTRODUCTION TO C LANGUAGE

CLASSES: 12

Algorithm -Definition, Characteristics of Algorithm. Constituents of algorithms: - Sequence, Selection and Repetition. Algorithm with Example: Roots Of a Quadratic Equations, Minimum and Maximum Numbers of a Given Set, Given number is prime number or not, given integer is palindrome or not, etc. Flowchart/Pseudo Code with examples.

Introduction To C Language: Structure of C Program, Data Types, Input and Output statements, Operators, Precedence and Associativity of operators, Evaluation of Expressions, Type Conversions In Expressions.

UNIT - II

CONTROL STRUCTURES AND ARRAYS

CLASSES: 15

Control structures: Decision statements; if and switch statement; **Loop control statements:** while, for and do while loops, Jump statements: break, continue, goto statements.

Arrays: Concepts, One dimensional array, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays

UNIT - III

FUNCTIONS AND POINTERS

CLASSES: 17

Functions: Function definition, Types of Functions: User defined and built-in Functions, Advantages of User Defined Functions. Parameter passing in functions: Call by value, Call by reference, Passing arrays to functions, Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Towers of Hanoi etc.. Storage classes.

Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, Functions returning pointers, Dynamic memory allocation.

UNIT - IV	STRINGS AND USER DEFINED DATA TYPES	CLASSES: 10
<p>Strings: Array of characters, variable length character strings, inputting character strings, character library functions, String Handling Functions, Arrays Of Strings</p> <p>Structures and Unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, Structures and functions, Self-referential structures, unions, typedef, enumerations.</p>		
UNIT - V	FILE HANDLING,SEARCHING AND SORTING	CLASSES: 10
<p>File Handling: Command Line Arguments, File Modes, Basic File Operations Read, Write and Append, Example Programs. Random Access Using fseek, ftell and rewind Functions.</p> <p>Basic Searching And Sorting Algorithms: Linear and Binary Search, Bubble Sort, Insertion Sort, Quick Sort.</p>		
TEXT BOOKS		
<ol style="list-style-type: none"> 1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition) 2. Byron Gottfried, "Programming with C", Schaum's Outlines Series, McGraw Hill Education, 3rd edition, 2017. 3. Programming in C E. Balagurusamy Edition 3 Publisher Tata McGraw-Hill Publishing, 1990 		
REFERENCE BOOKS		
<ol style="list-style-type: none"> 1. W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd Edition, 1988. 2. Yashavant Kanetkar, "Exploring C", BPB Publishers, 2nd Edition, 2003. 3. Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014. 4. R. S. Bichkar, "Programming with C", Universities Press, 2nd Edition, 2012. 4. Dey Pradeep, Manas Ghosh, "Computer Fundamentals and Programming in C", Oxford University Press, 2nd Edition, 2006. 5. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014. 		
WEB REFERENCES		
<ol style="list-style-type: none"> 1. https://en.wikipedia.org/wiki/Computational_thinking 2. https://nptel.ac.in/courses/106/104/106104128/ 3. https://en.cppreference.com/w/c/language 4. https://www.learn-c.org/ 		
E-TEXT BOOKS		
<ol style="list-style-type: none"> 1. https://slidelegend.com/queue/computational-thinking-for-the-modern-problem-solver_59d6f01e1723ddb0c7a0df47.html 2. http://flowgorithm.altervista.org/#elf_l1_Lw 3. http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download.htm 		
MOOC COURSE		
<ol style="list-style-type: none"> 1. https://www.coursera.org/learn/computational-thinking-problem-solving 2. https://onlinecourses.nptel.ac.in/noc18_cs33/preview 3. https://www.alison.com/courses/Introduction-to-Programming-in-c 4. http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s096-effective-programming-in-c-and-c-january-iap-2014/index.html 		

ENGLISH FOR SKILL ENHANCEMENT

I B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks			
A6HS01	HSMC	L	T	P	C	CIE	SEE	Total	
		3	0	0	3	40	60	100	
Contact Classes: 64		Tutorial Classes: NIL			Practical Classes: NIL			Total Classes: 64	

COURSE OBJECTIVES

The course will enable the students to:

1. Develop language proficiency with emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Apply the theoretical and practical components of English syllabus to study academic subjects more effectively and critically.
3. Analyze a variety of texts and interpret them to demonstrate in writing or speech.
4. Write/ compose clearly and creatively, and adjust writing style appropriately to the content, the context, and nature of the subject.
5. Develop language components to communicate effectively in formal and informal situations.

COURSE OUTCOMES

1. Will be able to acquire language proficiency with emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Apply the theoretical and practical components of English syllabus to study academic subjects more effectively and critically.
3. Analyze a variety of texts and interpret them to demonstrate in writing or speech.
4. Write/ compose clearly and creatively, and adjust writing style appropriately to the content, the context, and nature of the subject.
5. Use language components to communicate effectively in formal and informal situations

UNIT - I	'Toasted English' by R. K. Narayan	CLASSES: 08
Vocabulary	: The Concept of Word Formation -The Use of Prefixes and Suffixes – Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives – Synonyms and Antonyms	
Grammar	: Identifying Common Errors in Writing with Reference to Articles and Prepositions	
Reading:	: Reading and Its Importance- Techniques for Effective Reading	
Writing	: Sentence Structures – Use of Phrases and Clauses in Sentences – Importance of Proper Punctuation – Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph – Creating Coherence – Organizing Principles of Paragraphs in Documents.	
UNIT - II	'Appro JRD' by Sudha Murthy	CLASSES: 09
Vocabulary	: Words Often Misspelt–Homophones, Homonyms and Homographs	
Grammar	: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement	
Reading	: Sub-Skills of Reading –Skimming and Scanning– Exercises for Practice	

Writing	: Nature and Style of Writing-Defining/Describing People, Objects, Places and Events– Classifying-Providing Examples or Evidence.	
UNIT - III	'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al	CLASSES: 09
Vocabulary	: Words Often Confused– Words from Foreign Languages and their Use in English.	
Grammar	:Identifying Common Errorsin Writing with Reference to Misplaced Modifiers and Tenses	
Reading	:Sub-Skills of Reading – Intensive Reading and Extensive Reading –Exercises for Practice	
Writing	:Format of a Formal Letter - Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/ Resume	
UNIT - IV	Art and Literature	CLASSES: 08
Vocabulary	: Standard Abbreviations in English	
Grammar	: Redundancies and Clichés in Oral and Written Communication	
Reading	:Survey, Question, Read, Recite and Review (SQ3RMethod) – Exercises for Practice	
Writing	:Writing Practices- Essay Writing-Writing Introduction and Conclusion-Précis Writing	
UNIT - V	Go, Kiss the World' by Subroto Bagchi	CLASSES: 08
Vocabulary	: Technical Vocabulary and their Usage	
Grammar	: Common Errors in English (<i>Covering all the other aspects of grammar which were not covered in the previous units</i>)	
Reading	: Reading Comprehension-Exercises for Practice	
Writing	: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report	
TEXT BOOKS		
1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad.2022.Print.		
REFERENCE BOOKS		
<ol style="list-style-type: none"> 1. Effective Academic Writing by Liss and Davis(OUP) 2. Richards,JackC.(2022)InterchangeSeries.Introduction,1,2,3.CambridgeUniversityPress 3. Wood,F.T.(2007). Remedial English Grammar.Macmillan. 4. Chaudhuri,SantanuSinha.(2018).LearnEnglish:AFunBookofFunctionallanguage,GrammarandVocabulary.(2nded.).SagePublicationsIndiaPvt.Ltd. 5. (2019).Technical Communication. Wiley India Pvt. Ltd. 6. Vishwamohan,Aysha.(2013).EnglishforTechnicalCommunicationforEngineeringStudents.McGraw-Hill Education India Pvt.Ltd. 7. Swan,Michael.(2016).PracticalEnglishUsage.OxfordUniversityPress.FourthEdition 		
WEB REFERENCES		

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| <ol style="list-style-type: none">1. http://www.bbc.co.uk/learningenglish2. http://learnenglish.britishcouncil.org3. https://www.cambridgeenglish.org/learning-english/4. https://study.com/academy/subj/english.html |
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E-TEXT BOOKS

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| <ol style="list-style-type: none">1. https://www.pdfdrive.com/advanced-english-books.html |
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MOOC COURSES

- | |
|---|
| <ol style="list-style-type: none">1. http://nptel.ac.in/courses/109/106/1091060672. https://www.britishcouncil.org/tr/en/english/mooc |
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BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

I B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6EE60	ESC	L	T	P	C	CIE	SEE	Total
		3	0	0	3	40	60	100

COURSE OBJECTIVES

1. Develop fundamentals, including Ohm's law, Kirchhoff's laws and be able to solve for currents, voltages and power in electrical circuits.
2. Develop EMF equation and analyze the operation of DC Machines.
3. Analyze the working principle of Transformer.
4. Discuss the operation of AC Machines.
5. Analyze the operation of PN junction diode and rectifiers.
6. Discuss the operation and characteristics of Transistors.

COURSE OUTCOMES

Upon successful completion of this course, student will be able to :

1. Evaluate current and voltage values in resistive circuits with independent sources.
2. Explain the working of DC machines and solve the numerical problems..
3. Explain the working of AC electrical machines and solve the numerical problems.
4. Analyze the V-I characteristics of PN – junction diode and describe the operation of rectifiers.
5. Analyze the different configurations of Transistors and obtain its characteristics.

UNIT - I	ELECTRICAL CIRCUITS	CLASSES : 12
Basic definitions-Ohm's Law, types of elements, types of sources , Kirchhoff's Laws – simple problems., series & parallel resistive networks with DC excitation, star to delta and delta to star transformations.		
UNIT - II	DC MACHINES	CLASSES : 12
Principle of Operation of DC Motor, types of DC motor, Torque equation & Losses and problems. DC Generator construction and working Principle, EMF Equation types of generators and problems.		
UNIT - III	AC MACHINES	CLASSES : 12
Working principle and Construction of transformer, Emf Equation & problems. Principle operation of 3-phase induction motor, slip and torque Equation, Torque –slip characteristics & problems.		
UNIT - IV	DIODE AND ITS CHARACTERISTICS	CLASSES : 12
PN JUNCTION DIODE: Operation of PN junction Diode: forward bias and reverse bias, Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics. Rectifiers, Half wave, Full wave and bridge Rectifiers –capacitor filters, inductor filters		
UNIT - V	TRANSISTORS	CLASSES : 10
Bipolar Junction Transistor - NPN & PNP Transistor, CB, CE, CC Configurations and Characteristics.		

TEXT BOOKS

1. Basic Electrical Engineering by *M.S.Naidu and S.Kamakshaiah* TMH
2. Electronic Devices and circuits by *J.Millman, C.C.Halkias and Satyabrata Jit* 2ed.,

REFERENCE BOOKS

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
3. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2002).

ELECTRONIC DEVICES AND APPLICATIONS

I B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6EC03	ESC	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60	100

COURSE OBJECTIVES

1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of devices.
3. To know the switching characteristics of devices.

COURSE OUTCOMES

Upon completion of the Course, the students will be able to:

1. Acquire the knowledge of various electronic devices and their use in real life.
2. Know the applications of various devices.
3. Acquire the knowledge about the role of special purpose devices and their applications.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	-	-	1	1	-	-	-	-	1
CO2	3	2	3	-	-	2	1	-	-	-	-	1
CO3	3	3	3	-	-	2	1	-	-	-	-	1

UNIT - I DIODES

Diodes: Diode – Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch-switching times.

UNIT - II DIODE APPLICATIONS

Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Types of Clampers.

UNIT - III BIPOLAR JUNCTION TRANSISTOR (BJT)

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, Need for Biasing, BJT as Amplifier.

UNIT - IV JUNCTION FIELD EFFECT TRANSISTOR (FET)

Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, FET as amplifier.

UNIT - V SPECIAL PURPOSE DEVICES

Special Purpose Devices: Zener Diode - Characteristics, Zener diode as Voltage Regulator, Operation of - SCR, UJT, Photo diode, Solar cell, LED.

TEXT BOOKS

1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, LouisNashelsky Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson.

REFERENCE BOOKS

1. Horowitz-Electronic Devices and Circuits, David A. Bell-5th Edition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly – Basic Electronics – Principles and Applications, Cambridge, 2018.

PROGRAMMING FOR PROBLEM SOLVING LAB

I B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6CS03	ESC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36			Total Classes: 36			

COURSE OBJECTIVES

1. To be familiarize with flowgorithm to solve simple problems
2. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
3. To develop modular, reusable and readable C Programs using the concepts like functions, arrays, strings pointers and structures.

COURSE OUTCOMES

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

1. Solve simple mathematical problems using Flowgorithm.
2. Correct syntax errors as reported by the compilers and logical errors encountered at run time Develop programs by using decision making and looping constructs.
3. Implement real time applications using the concept of array, pointers, functions and structures.
4. Solve real world problems using matrices, searching and sorting.

LIST OF EXPERIMENTS

WEEK - 1	INTRODUCTION TO FLOGORITHM
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1. Installation and working of Flowgorithm Software.
2. Write and implement basic arithmetic operations using Flowgorithm – sum, average, product, difference, quotient and remainder of given numbers etc.
3. Draw a flowchart to calculate area of Shapes (Square, Rectangle, Circle and Triangle).
4. Draw a flowchart to find the sum of individual digits of a 3 digit number
5. Draw a flowchart to read input name, marks of 5 subjects of a student and display the name of the student, the total marks scored, percentage scored.
6. Draw a flowchart to find roots of a quadratic equation.
7. Draw a flowchart to find the largest and smallest among three entered numbers and also display whether the identified largest/smallest number is even or odd
8. Draw a flowchart to check whether the triangle is equilateral, isosceles or scalene triangle
9. Draw a flowchart to check whether a given number is palindrome or not.

WEEK - 2	BASIC DATA TYPES
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1. Write a C program to find division of 1 integer 1 float numbers.
2. Write a C program to find division of 2 integer numbers.
3. Write a C program to find average of (1int,1float) numbers.
4. Write a C Program to Swap Numbers without Using Temporary Variable
5. Write a C Program to Swap two Numbers Using Temporary Variable
6. Write a C Write a program to read the values of x, y and z and print the results of the following expressions in one line.

a) $(x+y+z) / (x-y-z)$ b) $(x+y+z) / 3$ c) $(x+y) * (x-y) * (y-z)$	
WEEK - 3	OPERATORS
1. Write a C program to convert temperature from Fahrenheit to Celsius and vice versa ($c=(f-32)/1.8$) 2. Write a C program to find area and perimeter of a circle. ($area=\pi r^2$ perimeter= $2\pi r$) 3. Write a C program to calculate area and perimeter of a right angled triangle. a. ($Area=1/2*b*h$ perimeter= $w+h+sqrt(w*w+h*h)$) 4. Find the sum of natural numbers 1 to n.(read n as input) (Use formula $sum=n(n+1)/2$) 5. Write a C program to calculate Simple interest ($SI=PTR/100$) 6. Write a C program to calculate area and perimeter of a rectangle. $Area=l*b$ Perimeter= $2*(l+b)$ 7. Write a C program to calculate the value of the third angle of a triangle if two angles are given as input. ($a+b+c=180$) 8. Write a C program to read the consumer number and number of units consumed and the cost per unit and print the amount to be paid. ($Amt=num\ of\ units*cost$) 9. Write a C Program to calculate area and perimeter of a triangle. b. Perimeter= $(a+b+c)$ c. $s=(a+b+c)/2$ d. $Area=sqrt(s*(s-a)(s-b)*(s-c))$ 10. Write a C program to read five Subject marks and find the average. 11. Write a C program to Calculate Compound interest ($CI=p(1+r/100)^n$)	
WEEK - 4	CONDITIONAL STATEMENTS
1. Write a C program to find largest and smallest of given numbers. 2. Write a C program which takes two integer operands and one operator form the user(+,-,*,/,% use switch) 3. Write a program to compute grade of students using if else ladder. The grades are assigned as followed: marks<50 F $50\leq\text{marks}< 60$ C $60\leq\text{marks}<70$ B $70\leq\text{marks}$ B+ $80\leq\text{marks}<90$ A $90\leq\text{marks}\leq 100$ A+ 4. Write a C program to whether given year leap year or not. 5. Write a C program to find whether given triangle is scalene or isosceles or equilateral.	
WEEK - 5	LOOPING STATEMENTS
1. Write a C program to find Sum of individual digits of given integer 2. Write a C program to generate first n terms of Fibonacci series 3. Write a C Program to find the Sum of Series $SUM=1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$ 4. Write a C program to print the Fibonacci sequence up to given value of n. 5. Write a C program to print the multiplication table to the given value of n. 6. Write a C program to check whether given number is palindrome or not 7. Write a C program to check whether given number is perfect or not	
WEEK - 6	NESTED LOOPING STATEMENTS
1. Write a C program to generate prime numbers between 1 and n 2. Write a C program to generate Pascal's triangle. 3. Write a C program to generate the following pyramid of numbers.	

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      1
     1 3 1
    1 3 5 3 1

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4. Write a C program to generate the pattern

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WEEK - 7**ARRAYS**

1. Write a C Program to implement following searching methods
 - i. Binary Search
 - ii. Linear Search
2. Write a C program to find largest and smallest number in a list of integers
3. Write a C program
 - iii. To add two matrices
 - iv. To multiply two matrices
4. Write a C program to find Transpose of a given matrix

WEEK - 8**FUNCTIONS**

1. Write a C program to find the factorial of a given integer using non recursive functions
2. Write a C program to find GCD of given integers using non recursive functions
3. Write a C Program to find the power of a given number using non recursive functions
4. Write a C program to find sum of natural numbers using non recursive function.
5. Write a C program to reverse a given integer number using non recursive functions
6. Write a C Program to find binary equivalent of a given decimal number using recursive functions.
7. Write a C Program to print Fibonacci sequence using recursive functions.
8. Write a C Program to find LCM of 3 given numbers using recursive functions
9. Write a C program to find the factorial of a given integer using recursive functions
10. Write a C program to print fibonacci series till n terms using recursion.

WEEK - 9**STRINGS**

1. Write a C program using to Insert a sub string into a given main string from a given position
2. Write a C program using to Delete n characters from a given position in a string
3. Write a C program to determine if given string is palindrome or not
4. Write C Programs to demonstrate the following string handling functions.
 - a. strcat()
 - b. strcmp()
 - c. strrev()
 - d. strcpy()
 - e. strlen()
 - f. strstr()
 - g. strncpy()
 - h. strncat()
 - i. strncmp()

WEEK - 10**POINTERS**

1.	Write a C program to read the elements of 1-d array using pointers and print them in reverse order using pointers.
2.	Write a C Program to read two elements dynamically using malloc() function and interchange the two numbers using call by reference.
3.	Write a C Program to read and print the elements of 1-D array using calloc() memory allocation function and reallocate memory for the array by increasing the size of the array, read and print the elements of reallocated array.
4.	Write a C Program to print 2-D array using pointers.
WEEK - 11	STRUCTURES
1.	Write a C Program using functions to <ol style="list-style-type: none"> Reading a complex number Writing a complex number Add two complex numbers Multiply two complex numbers Note: represent complex number using structure
2.	Write a C program to read employee details employee number, employee name, basic salary, hra and da of n employees using structures and print employee number, employee name and gross salary of n employees.
WEEK - 12	FILES
1.	Write a C program to read and print the content of a file.
2.	Write a C program copy the content of one file to another file
3.	Write a C program to merge two file into third file.
4.	Write a C Program to find the number of lines in a text file
TEXT BOOKS	
1.	Riley DD, Hunt K.A. Computational Thinking for the Modern Problem Solver. CRC press, 2014 Mar 27.
2.	B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition) YashavantKanetkar, "Let Us C", BPB Publications, New Delhi, 13 th Edition, 2012.
REFERENCE BOOKS	
1.	Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer; 2018
2.	King KN, "C Programming: A Modern Approach", Atlantic Publishers, 2nd Edition, 2015.
3.	Kochan Stephen G, "Programming in C: A Complete Introduction to the C Programming Language", Sam's Publishers, 3rd Edition, 2004.
4.	Linden Peter V, "Expert C Programming: Deep C Secrets", Pearson India, 1 st Edition, 1994.
WEB REFERENCES	
1.	http://www.flowgorithm.org/documentation/
2.	http://www.sanfoundry.com/c-programming-examples
3.	http://www.geeksforgeeks.org/c
4.	http://www.cprogramming.com/tutorial/c

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

I B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6HS02	HSMC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100
Contact Classes: 00	Tutorial Classes: 00	Practical Classes: 39			Total Classes:39			

COURSE OBJECTIVES

The course should enable the students to:

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize the impact of dialects.
5. To train students to use language appropriately for public speaking, group discussions and interviews

COURSE OUTCOMES

Students will be able to:

1. Acquire the skill of independent language learning
2. Overcome with the nuances of English speech sounds, word accent, intonation and rhythm.
3. Obtain the consistent accent and intelligibility in pronunciation.
4. Neutralize the impact of dialects.
5. Apply language appropriately public speaking, group discussions and interviews

English Language and Communication Skills Lab (ELCS) shall have two parts:

- a. **Computer Assisted Language Learning (CALL) Lab**
- b. **Interactive Communication Skills (ICS) Lab**

Listening Skills

Objectives

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

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

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

Speaking Skills

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
 - Oral practice
 - Describing objects/situations/people
 - Role play – Individual/Group activities
 - Just A Minute (JAM) Sessions

EXERCISE - I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs-Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written language- Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

EXERCISE - II

CALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

EXERCISE - III

<p>CALL Lab: Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI). Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation - Testing Exercises</p> <p>ICS Lab: Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.</p>	
EXERCISE - IV	
<p>CALL Lab: Understand: Listening for General Details. Practice: Listening Comprehension Tests - Testing Exercises</p> <p>ICS Lab: Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills. Practice: Making a Short Speech – Extempore- Making a Presentation.</p>	
EXERCISE - V	
<p>CALL Lab: <i>Understand:</i> Listening for Specific Details. <i>Practice:</i> Listening Comprehension Tests - <i>Testing Exercises</i></p> <p>ICS Lab: <i>Understand:</i> Group Discussion <i>Practice:</i> Group Discussion</p>	
REFERENCE BOOKS	
<ol style="list-style-type: none"> 1. (2022). <i>English Language Communication Skills – Lab Manual cum Workbook</i>. Cengage Learning India Pvt. Ltd. 2. Shobha, KN & Rayen, J. Lourdes. (2019). <i>Communicative English – A workbook</i>. Cambridge University Press 3. Kumar, Sanjay & Lata, Pushp. (2019). <i>Communication Skills: A Workbook</i>. Oxford University Press 4. Board of Editors. (2016). <i>ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities</i>. Orient Black Swan Pvt. Ltd. 5. Mishra, Veerendra et al. (2020). <i>English Language Skills: A Practical Approach</i>. Cambridge University Press 	
WEBSITES	
<ol style="list-style-type: none"> 1. https://www.britishcouncil.org 2. https://www.bbc.co.uk 3. https://www.grammarly.com 4. https://www.fluentu.com 5. https://www.cambridgeenglish.org/exams-and-tests/business-preliminary 6. https://www.cambridgeenglish.org/exams-and-tests/business-vantage 	

INTRODUCTION TO INTERNET OF THINGS

I B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6EC04	ESC	L	T	P	C	CIE	SEE	Total
		0	0	2	1	40	60	100

COURSE OBJECTIVES

1. To develop basic programming skills through graphical programming
2. To learn hardware interfacing and debugging techniques
3. To design and develop android apps

COURSE OUTCOMES

At the end of the course, student will be able to the algorithms for simple problems

1. CO 1: Able to demonstrate various sensor interfacing using Visual Programming Language.
2. CO 2: Able to analyze various Physical Components.
3. CO 3: Able to demonstrate Wireless Control of Remote Devices.
4. CO 4: Able to design and develop Mobile Application which can interact with Sensors

INTRODUCTION TO IOT

1. Introduction to basic electronic components and digital electronic
2. Introduction to sensors and Actuators
3. Introduction to microcontroller
4. Introduction to Arduino IDE

LIST OF EXPERIMENTS

WEEK - 1	Blinking of LED with different delays
WEEK - 2	Digital I/O Interface [IR Sensor, PIR Sensor]
WEEK - 3	Analog Interface [ADC, Temperature Sensor]
WEEK - 4	Motor speed And Direction control
WEEK - 5	Serial Communication
WEEK - 6	Wireless Interface –Bluetooth & Wi-Fi Technologies
WEEK - 7	Wireless Control of wheeled robot
WEEK - 8	Smart Home Android App Development

REFERENCES

1. Sylvia Libow Martinez, Gary S Stager, Invent To Learn: Making, Tinkering, and Engineering in the Classroom, Constructing Modern Knowledge Press, 2016
2. Michael Margolis, Arduino Cookbook, Oreilly, 2011

SEMINAR

I B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A6HS04	HSMC	0	0	2	1	100	0	100

COURSE OBJECTIVES

Seminar is an important component of learning in an Engineering College, where the student gets acquainted with preparing a report & presentation on a topic.

PERIODICITY / FREQUENCY OF EVALUATION : Twice

PARAMETERS OF EVALUATION:

1. The seminar shall have topic allotted and approved by the faculty.
2. The seminar is evaluated for 50 marks for internal only.
3. The students shall be required to submit the rough drafts of the seminar outputs within one week of the commencement of the class work.
4. Faculty shall make suggestions for modification in the rough draft. The final draft shall be presented by the student within a week thereafter.
5. Presentation schedules will be prepared by Department in line with the academic calendar.

THE SEMINARS SHALL BE EVALUATED IN TWO STAGES AS FOLLOWS:

A. ROUGH DRAFT

In this stage, the student should collect information from various sources on the topic and collate them in a systematic manner. He/ She may take the help of the concerned faculty.

The report should be typed in "MS-Word" file with "calibri" font, with font size of 16 for main heading, 14 for sub-headings and 11 for the body text. The contents should also be arranged in Power Point Presentation with relevant diagrams, pictures and illustrations. It should normally contain 10 to 15 slides, consisting of the followings:

1.	Topic, name of the student & faculty	1 Slide
2.	List of contents	1 Slide
3.	Introduction	1 Slides
4.	Descriptions of the topic (point-wise)	6 - 10 Slides
5.	Conclusion	1 - 2 Slides
6.	References/Bibliography	1 Slide

The soft copy of the rough draft of the seminar presentation in MS Power Point format along with the draft report should be submitted to the concerned faculty, with a copy to the concerned HOD within stipulated time.

Diodes: Diode – Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch-switching times.

The evaluation of the rough draft shall generally be based upon the following.

1	Punctuality in submission of rough draft	2
2	Dress Code	3
3	Resources from which the seminar have been based	2
4	Report , and content of Presentation	5
5	Depth of the students knowledge in the subject	5
6	Reception from Questions	5
7	Time Management, Classroom Dynamic	3
	Total Marks	25

After evaluation of the first draft the supervisor shall suggest further reading, additional work and fine tuning, to improve the quality of the seminar work. Within 7 days of the submission of the rough draft, the students are to submit the final draft incorporating the suggestions made by the faculty.

I B.TECH II SEMESTER SYLLABUS

NUMERICAL METHODS AND INTEGRAL TRANSFORMS

I B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6BS02	BSC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100
Contact Classes: 44		Tutorial Classes: 08		Practical Classes: Nil			Total Classes: 52	

COURSE OBJECTIVES

To learn

1. Curve fitting and Interpolation techniques.
2. Numerical techniques.
3. Fourier series for periodic function
4. Laplace transforms
5. Concept and application of Fourier Transforms and Vector differentiation.

COURSE OUTCOMES

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

1. Apply Curve fitting and Interpolation techniques.
2. Apply various numerical techniques
3. Find the Fourier series of the periodic functions.
4. Obtain the Laplace transforms of functions
5. Find Fourier transforms and apply vector differentiation techniques.

UNIT - I

INTERPOLATION AND CURVE FITTING

CLASSES: 08

INTERPOLATION: Finite differences: Forward, Backward and Central differences - Other difference operators and relations between them - Difference of a polynomial – Missing terms - Newton's forward interpolation, Newton's backward interpolation, Gauss's forward and backward interpolation formulae. Interpolation with unequal intervals – Lagrange's interpolation.

CURVE FITTING: Method of least squares - Fitting a straight line, second degree parabola and non-linear curves of the form $y = a e^{bx}$, $y = a x^b$, $y = a b^x$ by the method of least squares.

UNIT - II

NUMERICAL TECHNIQUES

CLASSES: 08

ROOT FINDING TECHNIQUES:

Bisection method Regula-Falsi method, iteration method and Newton Raphson method.

NUMERICAL INTEGRATION :

Trapezoidal rule - Simpson's one-third rule - Simpson's three-eighth rule.

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:

Taylor's series method – Euler's - modified Euler's Method – Runge-Kutta method.

UNIT - III

FOURIER SERIES

CLASSES: 10

Periodic function-Determination of Fourier Coefficients-Fourier Series-Even and Odd functions-Fourier series in arbitrary interval-Half range Fourier sine and cosine expansions.

UNIT - IV

LAPLACE TRANSFORMS

CLASSES: 10

Laplace transforms of elementary functions- First shifting theorem - Change of scale property – Multiplication by t^n - Division by t – Laplace transforms of derivatives and integrals – Unit step function – Second shifting theorem – Periodic function – Evaluation of integrals by Laplace transforms – Inverse Laplace transforms-

Method of partial fractions – Other methods of finding inverse transforms – Convolution theorem – Applications of Laplace transforms to ordinary differential equations.

UNIT - V**FOURIER TRANSFORMS AND VECTOR DIFFERENTIATION****CLASSES: 10**

Fourier Integral theorem (Statement only)-Fourier Sine and Cosine Integrals, Fourier Transforms, Cosine and Sine transforms, properties, Inverse transforms.

Vector functions, vector differentiation, gradient, directional derivative, divergence, curl and scalar potential.

TEXT BOOKS

1. Ervin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers, 36th Edition, 2010.

REFERENCE BOOKS

1. G.B.Thomas, calculus and analytical geometry,9th Edition, Pearson Reprint 2006.
2. N.P Bali and Manish Goyal ,A Text of Engineering Mathematics,Laxmi publications,2008.
3. E.L.Ince, Ordinary differential Equations,Dover publications,1958.

WEB REFERENCES

1. https://www.efunda.com/math/math_home/math.cfm
2. <https://www.ocw.mit.edu/resources/#Mathematics>
3. <https://www.sosmath.com/>
4. <https://www.mathworld.wolfram.com/>

E -TEXT BOOKS

1. <https://www.e-booksdirectory.com/details.php?ebook=10166>

MOOCS COURSE

1. <https://swayam.gov.in/>
2. <https://onlinecourses.nptel.ac.in/>

APPLIED PHYSICS

I B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6BS07	BSC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100

COURSE OBJECTIVES

The course should enable the students to:

1. Learn the basic principles of quantum physics and its applications
2. Understand the formation of energy bands and atomic structure in solids for material classification
3. Understand the underlying mechanism involved in construction and working properties of different types of semiconductor devices
4. Learn the basic principles of laser and optical fiber in information technology
5. Identify the importance of nanoscale and various fabrication and characterization techniques and quantum computations in engineering applications

COURSE OUTCOMES

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

1. **Analyze** the microscopic properties of materials using principles of quantum physics for engineering applications
2. **Explain** the behavior of different electronic materials based on the concepts of band theory
3. **Apply** the knowledge of Solar PV cells for choice of materials in efficient alternate energy generation
4. **Gain** the knowledge of production of laser and usage of fibers in fiber optic communication technology
5. **Comprehend** the knowledge of quantum physics in quantum computation for secure information technology

UNIT - I	QUANTUM PHYSICS	CLASSES: 10
<p>Black body radiation, Stefan-Boltzmann's law, Planck's radiation law (Qualitative treatment), Photoelectric effect, Waves and Particles, de Broglie Hypothesis, Matter Waves, Davisson and Germer's experiment, Heisenberg's Uncertainty Principle, Schrodinger's Time Independent Wave Equation, Physical Significance of the wave Function, Particle in One Dimensional Potential Box.</p>		
UNIT - II	ELECTRONIC PROPERTIES OF MATERIALS & BAND THEORY OF SOLIDS	CLASSES: 10
<p>Electronic properties of Materials: Classical free electron theory and Quantum free electron theories of metals, success and drawbacks, Bloch theorem, Kronig-Penny model (Qualitative treatment), E-k diagram, effective mass of electron.</p> <p>Band theory of solids: Origin of energy band formation in solids, Fermi energy level, Fermi-Dirac distribution law, Classification of materials as conductors, insulators and semiconductors.</p>		
UNIT - III	SEMI-CONDUCTORS & SEMICONDUCTOR DEVICES	CLASSES: 08

Semiconductors: Intrinsic and Extrinsic Semiconductors, formation of PN junction diode and its V-I characteristics, Direct and Indirect band gap semiconductors, Hall effect and its applications.

Semiconductor Devices: Construction, working and V-I characteristics of PIN Diode, LED, Solar cell and their applications.

UNIT - IV**LASER & FIBER OPTICS****CLASSES: 12**

Laser: Characteristics of Laser, Absorption, Spontaneous and Stimulated emission of radiations. Lasing actions-Pumping mechanism, Meta stable state and Population inversion, Nd-YAG laser, CO2 laser, Applications of lasers in different fields.

Fiber Optics: Structure of fibers, Total Internal Reflection, Acceptance angle – Numerical Aperture, Types of fibers- SI and GI fibers, Single and Multimode fibers - SMSI, MMSI, MMGI, Fiber Optic Communication system, Signal Degradation - Attenuation mechanism, Dispersion, Applications of fibers in different fields.

UNIT - V**PHYSICS OF QUANTUM COMPUTING & QUANTUM GATES****CLASSES: 10**

Physics of Quantum computing: Idea of classical bits and qubits, advantages with qubits over classical bits, Bloch vector representation of state of qubits.

Quantum gates-Single qubit logic gates- Pauli X, Y, Z and Hadmard gate in matrix form, Two level gates- CNOT and SWAP gates and representation in matrix form, Comments on No cloning theorem, Entanglement, Quantum Teleportation – Basic Idea, Quantum Key distribution protocol - BB84 protocol.

TEXT BOOKS

1. P.K Palanisamy, Engineering Physics, Sitech Publications, 2013, IVth Ed.
2. Nielsen M. A., I. L Chung, Quantum Computation & Quantum Information, Cambridge Univ. Press.
3. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.

REFERENCE BOOKS

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons, 11th Edition, 2018.
3. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication, 2019
4. B.K Pandey and Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022

ENGINEERING CHEMISTRY

I B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6BS09	BSC	L	T	P	C	CIE	SEE	Total
		3	1	0	4	40	60	100
Contact Classes:50	Tutorial Classes: 0	Practical Classes: 0			Total Classes: 50			

COURSE OBJECTIVES

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

COURSE OUTCOMES

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

1. Understand the basic properties of water and its usage in domestic and industrial purpose.
2. Acquire the basic knowledge of electrochemical procedures related to corrosion
3. Learn the fundamentals and general properties of polymers and other engineering materials.
4. Predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT - I	WATER AND ITS TREATMENT	CLASSES: 10
<p>Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation- Determination of F- ion by ion- selective electrode method. Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water -Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods -Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.</p>		
UNIT - II	BATTERY CHEMISTRY AND FUEL CELLS	CLASSES: 10
<p>Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells. Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion –mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.</p>		
UNIT - III	POLYMERIC MATERIALS	CLASSES: 10

<p>Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP). Rubbers: Natural rubber and its vulcanization. Elastomers: Characteristics – preparation – properties and applications of Buna-S, Butyl and Thiokol rubber. Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers. Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.</p>		
UNIT - IV	ENERGY SOURCES	CLASSES: 10
<p>Introduction, Calorific value of fuel – HCV, LCV- Dulong's formula. Classification- solid fuels: coal –analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.</p>		
UNIT - V	ENGINEERING MATERIALS	CLASSES: 10
<p>Cement: Portland cement, its composition, setting and hardening. Smart materials and their engineering applications Shape memory materials- Poly L- Lactic acid. Thermo response materials- Polyacryl amides, Poly vinyl amides Lubricants: Classification of lubricants with examples-characteristics of a good lubricants – mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point</p>		
TEXT BOOKS		
<ol style="list-style-type: none"> 1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010 2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning,2016 3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021. 4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications 		
REFERENCE BOOKS		
<ol style="list-style-type: none"> 1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015) 2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011) 		

ENGINEERING DRAWING

I B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6ME02	ESC	L	T	P	C	CIE	SEE	Total
		1	0	3	2.5	40	60	100

COURSE OUTCOMES

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

1. Understand various commands and create drawing in AutoCAD.
2. Construct various engineering curves and know their importance.
3. Prepare orthographic projections of objects by visualizing them in different positions.
4. Solve the problem of projections of planes and solids in different positions.
5. Construct the isometric view into orthographic views and vice versa.

UNIT - I

INTRODUCTION TO ENGINEERING DRAWING

Introduction to Engineering Drawing: Principles and their significance.

Introduction to Computer Aided Drafting: Initial Setup Commands, Draw Commands, modify commands, 2D Drawings-Simple Exercises.

UNIT - II

ENGINEERING CURVES

Engineering Curves: Ellipse, Parabola, and Hyperbola (General Method only), Involutes.

UNIT - III

ORTHOGRAPHIC PROJECTIONS OF POINTS AND LINES

Principles of Orthographic Projections –Projections of points.

Projection of lines inclined to both planes (First angle projection only).

UNIT - IV

PROJECTIONS OF PLANES AND SOLIDS

Projections of Planes: Projections of regular planes inclined to one plane.

Projection of Solids: Solids inclined to one plane (Regular solids).

UNIT - V

ISOMETRIC VIEW AND ORTHOGRAPHIC VIEWS - CONVERSION

Isometric view: Drawing Isometric circles, Dimensioning Isometric Objects.

Conversion of Isometric view to Orthographic views and Orthographic to isometric view.

TEXT BOOKS

1. Bhatt N.D., Panchal V.M. & Ingle P.R., Engineering Drawing, Charotar Publishing House.
2. Agrawal B. & Agrawal C. M., Engineering Graphics, TMH Publication.

REFERENCE BOOKS

1. D.M. Kulkarni, A.P.Rastogi, A.K. Sarka "Engineering Graphics with AutoCAD" PHI publications.
2. Narayana, K.L. & P Kannaiah, Text book on Engineering Drawing, Scitech Publishers.
3. Shah, M.B. & Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education.

APPLIED PHYSICS LAB

I B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6BS08	BSC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

COURSE OBJECTIVES

The course should enable the students to:

- Understand the temperature and other dependent properties of semiconductor devices and their usages in different applications
- To know the Laser and Fibre optic technologies and its applications in real time scenario
- Understand the electromagnetic properties using experimental knowledge
- Understand the method of least squares fitting

COURSE OUTCOMES

By the end of the course students will be able to:

- Analyze** the electric properties of semiconductor materials by determining energy gap of semiconductors, charge carrier concentration in Semiconductors using Hall effect and threshold voltage of LEDs, photo current in Photo diodes, solar cell, and temperature effect on resistance using thermistor.
- Identify** the optical properties of light such as diffraction phenomenon using grating material for calculation of the wavelength of Laser and acceptance angle, NA of optical fiber using OFC and determine the value of Plank's constant using a light source and interference by using Newton's rings
- Analyze** the electromagnetic properties of a current carrying coil by using Stewart Gee's experiment
- Analyze** the least squares fitting method for data analysis using experimental data of Tensional pendulum

APPLIED PHYSICS LABORATORY LIST OF EXPERIMENTS

Experiment - 1	ENERGY GAP OF P-N JUNCTION DIODE: To determine the energy gap of a given semiconductor diode
Experiment - 2	SOLAR CELL: To study the V-I and V-P characteristics and determine the fill factor of solar cell
Experiment - 3	LIGHT EMITTING DIODE: To study the characteristics of LED by plotting V-I graph and determine the threshold value of given LEDs
Experiment - 4	HALL EFFECT: To determine Hall co-efficient and charge carrier concentration of a given semiconductor
Experiment - 5	PIN PHOTO DIODE: To study the V-I Characteristics of Photo Diode with respect to intensity of light
Experiment - 6	OPTICAL FIBRE: To determine the numerical aperture and acceptance angle of an optical fiber
Experiment - 7	LASER: To determine the wavelength of a given laser source by using diffraction grating method
Experiment - 8	NEWTON'S RINGS: To determine the radius of curvature of a given Plano convex lens by forming Newton's rings
Experiment - 9	THERMISTOR: To study the variation of resistance with respect to temperature using thermistor

Experiment - 10	Understanding the method of least squares - Torsional pendulum as an example
Experiment – 11	PLANCK'S CONSTANT: To determine value of planck's constant by measuring radiation in fixed spectral range
Experiment - 12	STEWART GEE'S EXPERIMENT: To study the variation of magnetic field along the axis of a circular coil and calculation of magnetic flux
Note: Students have to perform any 8 experiments	
REFERENCE BOOKS	
<ol style="list-style-type: none">1. Applied Physics Lab Manual"- Dr. Radhika Devi, Mr. A V Laxman Rao, N. Noel2. S. Balasubramanian, M.N Srinivasan "A Text book of practical Physics" – S Chand Publishers, 2017.	

PYTHON PROGRAMMING LAB

I B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6CS04	ESC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100

COURSE OBJECTIVES

1. To understand the problem-solving approaches.
2. To learn the basic programming constructs in Python.
3. To practice various computing strategies for Python-based solutions to real world problems.
4. To use Python data structures – lists, tuples, dictionaries.
5. To do input/output with files in Python

COURSE OUTCOMES

1. Write, test, and debug simple Python programs.
2. Implement Python programs with conditions and loops.
3. Develop Python programs step-wise by defining functions and calling them.
4. Use Python lists, tuples, dictionaries for representing compound data.
5. Read and write data from/to files in Python

SYLLABUS

LIST OF PROGRAMS

WEEK - 1

- a) Write a program to perform different Arithmetic Operations on numbers in Python
- b) Write a Python program which accepts the radius of a circle from the user and compute the area.
- c) Write a Python program to get the Python version you are using.
- d) Write a Python program that accepts an integer (n) and computes the value of n+nn+nnn

WEEK - 2

- a) Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: $c/5 = f-32/9$]
- b) Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
- c) A library charges a fine for every book returned late. For first 6 days the fine is 50 paise, for 10-15 days fine is one rupee and above 15 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled.
- d) Write a python program to accept the number of days the member is late to return the book and display the fine or the appropriate message.

WEEK - 3

	<p>a) Write a python function to find largest of three numbers.</p> <p>b) Write a Python function that prints prime numbers in between 50 and 100.</p> <p>c) Write a python program to find factorial of a number using Recursion.</p> <p>d) Write a function that receives marks received by a student in 6 subjects and returns the average and percentage of these marks. Call this function from main() and print the result in main</p>
WEEK - 4	
	Write a program to demonstrate working with Strings and string operations.
WEEK - 5	
	Write a program to demonstrate working with dictionaries in python
WEEK - 6	
	Write a program to demonstrate working with tuples and List in python.
WEEK - 7	
	<p>a) Write a script named hellow.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.</p> <p>b) Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order</p>
WEEK - 8	
	Write python programs to demonstrate class & object, static and instance method implementation.
WEEK - 9	
	Write python programs to demonstrate Inheritance and Polymorphism
WEEK - 10	
	Write python programs to demonstrate Exception Handling in python
WEEK - 11	
	Write python programs to demonstrate NumPy library and supporting functions.
WEEK - 12	
	<p>a) Draw an Olympic Symbol in Python using Turtle</p> <p>b) Develop a simple login page using GUI Tkinter</p>
TEXT BOOKS	

1. Allen B. Downey, Think Python : How to Think like a Computer Scientist, 2nd Edition, Oâ€™Reilly Publishers, 2016.
2. Karl Beecher, Computational Thinking: A Beginners Guide to Problem Solving and Programming, 1st Edition, BCS Learning and Development Limited,2017.

REFERENCE REFERENCES

1. Paul Deitel and Harvey Deitel, Python for Programmers, Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, Computational Thinking: A Primer for Programmers and Data Scientists, 1st Edition, Notion Press, 2021.
3. John V Guttag, Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data, Third Edition, MIT Press, 2021
4. Eric Matthes, Python Crash Course, A Hands – on Project Based Introduction to Programming, 2nd Edition, No Starch Press, 2019. <https://www.python.org/>
5. Martin C. Brown, Python: The Complete Reference, 4th Edition, Mc-Graw Hill, 2018.

ENGINEERING WORK SHOP

I B. TECH- II SEMESTER								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6ME04	ESC	L	T	P	C	CIE	SEE	Total
		0	0	3	1.5	40	60	100
COURSE OUTCOMES								
At the end of the course the student should be able to:								
<ol style="list-style-type: none"> 1. Assemble the different components 2. Identify and apply suitable tools for different trades of Engineering processes. 3. Practice on manufacturing of components using workshop trades including Soldering, Carpentry, Fitting and Tin smithy & Fabricate Components with their own hands. 4. Apply basic electrical engineering knowledge for house wiring practice. 5. Learn the safety precautions for various operations in basic trades. 								
WEEKS	TRADES FOR EXERCISES							
	Fitting							
WEEK 1	Filing Four Sides of MS Work piece							
WEEK 2	L Fit							
	Carpentry							
WEEK 3	Half Lap Joint							
WEEK 4	Dove Tail Joint							
	Tin Smithy							
WEEK 5	Prepare a Rectangular Tray							
WEEK 6	Prepare A Square Tin							
	Electrical							
WEEK 7	Series and Parallel Connection One Way Switch							
WEEK 8	Two Way Switch Connection Stair Case Wiring							
	Electronics							
WEEK 9	Soldering - Series Connection & Parallel Connection							
WEEK 10	Desoldering & Construction of Wheat stone bridge							
	TRADES FOR DEMONSTRATION AND EXPOSURE							

WEEK 11	Introduction to Black smithy
WEEK 12	Introduction to Plumbing
TEXT BOOKS	
<ol style="list-style-type: none">1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech.2. Workshop Manual / K. Venugopal / Anuradha.	
REFERENCE BOOKS	
<ol style="list-style-type: none">1. Hajra Choudhury S.K., Hajra Choudhury A.K.and Nirjhar Roy S.K., "Elements of Workshop Technology", Media promoters and publishers private limited, Mumbai, Vol. I 2008 and Vol. II 2010.2. Workshop Manual / Venkat Reddy/ BSP	

ELEMENTS OF COMPUTER SCIENCE AND ENGINEERING

I B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIE	SEE
A6CS01	HSMC	0	0	2	1	100	0	100

COURSE OBJECTIVES

- To provide an overview of the subjects of computer science and engineering.

COURSE OUTCOMES

- Know the working principles of functional units of a basic Computer
- Understand program development, the use of data structures and algorithms in problem solving.
- Know the need and types of operating system, database systems.
- Understand the significance of networks, internet, WWW and cyber security.
- Understand Autonomous systems, the application of artificial intelligence.

UNIT - I BASICS OF A COMPUTER

CLASSES: 10

Basics of a Computer – Hardware, Software, Generations of computers. Hardware - functional units, Components of CPU, Memory – hierarchy, types of memory, Input and output devices. Software –systems software, application software, packages, frameworks, IDEs.

UNIT - II SOFTWARE DEVELOPMENT

CLASSES: 10

Software development – waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, data structures – definition, types of data structures

UNIT - III OPERATING SYSTEMS AND DATABASE MANAGEMENT SYSTEMS

CLASSES: 10

Operating systems: Functions of operating systems, types of operating systems, Device & Resource management
Database Management Systems: Data models, RDBMS, SQL, Database Transactions, data centers, cloud services

UNIT - IV COMPUTER NETWORKS

CLASSES: 10

Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensor networks, vehicular networks, 5G communication.
World Wide Web – Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Online social networks.
Security – information security, cyber security, cyber laws

UNIT - V AUTONOMOUS SYSTEMS

CLASSES: 10

Autonomous Systems: IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development, natural language processing, image and video processing. Cloud Basics

TEXT BOOKS

- Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield. 5th Edition, 2010

REFERENCE BOOKS

1. Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press, 2nd Edition, 2020.
2. Introduction to computers, Peter Norton, 8th Edition, Tata McGraw Hill.
3. Computer Fundamentals, Anita Goel, Pearson Education India, 2010.
4. Elements of computer science, Cengage

ENVIRONMENTAL SCIENCE

I B. TECH- II SEMESTER								
Course Code:	Category	Hours/Week			Credits	Maximum Marks		
A6BS11	MC	L	T	P	C	CIE	SEE	Total
		3	0	0	0	0	40	60
Contact Classes: 30		Tutorial Classes: 0		Practical Classes: 0			Total Classes:30	
<p style="color: blue; font-weight: bold; margin: 0;">COURSE OUTCOMES</p> <p style="margin: 0;">On Successful completion of this course, Students will be able to</p> <ol style="list-style-type: none"> 1. Identify the consequences of human actions on the web of life, global economy and quality of human life. 2. Evaluate the strategies for scientific, social, economic and legal environmental protection. 3. Study the impact of conservation of biodiversity. 4. Analyze the reasons for environmental pollution. 5. Assess the environmental impact of air, water, biological and socio-economical aspects and risk assessment towards sustainable future. 								
UNIT - I	ECOSYSTEMS						CLASSES:7	
<p>Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food web and ecological pyramids.</p> <p>Flow of energy, Biogeochemical cycles, Bio accumulation, Bio magnification, eco system value, services and carrying capacity.</p>								
UNIT - II	NATURAL RESOURCES						CLASSES: 8	
<p>Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems-case studies. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources. Land resources: Forest resources.</p> <p>Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.</p>								
UNIT - III	BIODIVERSITY AND BIOTIC RESOURCES						CLASSES: 5	
<p>Bio diversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values.</p> <p>India as a mega diversity nation: Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of bio diversity: In-Situ and Ex-situ conservation. National Biodiversity Act-Case studies.</p>								
UNIT - IV	ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES						CLASSES:5	
<p>Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution, Water Pollution drinking water quality standards. Soil Pollution Impacts of modern agriculture, Noise Pollution Health hazards, standards. Concepts of bioremediation.</p> <p>Global Environmental Problems and Global Efforts: Ozone depletion and Ozone depleting</p>								

substances (ODS) Concepts of Bioremediation International conventions /Protocols: Earth summit, Kyoto protocol and Montréal Protocol; NAPCC-Gol Initiatives, COP 24, COP25.

UNIT - V**ENVIRONMENTAL POLICY, LEGISLATION & EIA****CLASSES:5**

Environmental Policy, Legislation & Environmental Impact Assessment (EIA): Environmental Protection act, Legal aspects Air Act1981, Water Act, Forest Act, Wildlife Act, Municipal solid waste management, biomedical waste management hazardous waste management and handling rules.

Environmental Impact Assessment: EIA structure, methods of baseline data acquisition. Strategies for risk assessment, Towards Sustainable Future: Concept of Sustainable Development, Urban Sprawl, Concept of Green Building.

TEXT BOOKS

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R.Rajagopalan, Oxford University Press.

II B.TECH I SEMESTER SYLLABUS

COMPUTER ORIENTED STATISTICAL METHODS

II B. TECH- I SEMESTER

Course Code:	Category	Hours / Week			Credits	Maximum Marks		
A6BS03	BSC	L	T	P	C	CIE	SEE	Total
		3	1	-	4	40	60	100

COURSE OBJECTIVES

1. Evaluation of Probability distribution of Discrete and Continuous random variables and their moments.
2. The concept of correlation and regression, covariance and sampling distribution
3. Evaluation of the given data for appropriate test of hypothesis for large samples.
4. Evaluation of the given data for appropriate test of hypothesis for small samples and one way ANOVA
5. To learn the concept of Markov chain, transition probabilities in discrete & continuous time and Stochastic simulation techniques.

COURSE OUTCOMES

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

1. Evaluation of Probability distribution of Discrete and Continuous random variables and their moments.
2. Apply the concept of correlation and regression to find covariance and Sampling distribution
3. Evaluate the given data for appropriate test of hypothesis for Large samples.
4. Evaluate the given data for appropriate test of hypothesis for small samples and one way ANOVA
5. Recognize if a given stochastic system with finite number of states is a Markov chain or not and also identify classes of states in Markov chains and Characterize the states.

UNIT - I	RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS	CLASSES: 08
Random Variables – Discrete and Continuous. Probability distributions, mass function/ density function of a probability distribution, mathematical expectation,. Binomial, Poisson, Normal distributions -their Properties. Moments about origin, central moments, skewness, Kurtosis and find the mean and variance.		
UNIT - II	CORRELATION & REGRESSION AND SAMPLING DISTRIBUTIONS	CLASSES: 09
Coefficient of correlation, the rank correlation, Covariance of two random variables. Regression- Regression Coefficient, The lines of regression. Sampling: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimation- Point estimation and interval estimation		
UNIT - III	TESTING OF HYPOTHESIS - I	CLASSES: 09
Testing of hypothesis: Null hypothesis, Alternate hypothesis, Type I& Type II errors – critical region, confidence interval, Level of significance. One sided test, Two sided test. Large sample tests: (i) Test of Equality of means of two samples, equality of sample mean and population mean (cases of known variance & unknown variance, equal and unequal variances) (ii) Tests of significance of difference between sample S.D and population S.D. (iii) Tests of significance difference between sample proportion and population proportion, difference between two sample proportions.		

UNIT – IV	TESTING OF HYPOTHESIS-II	CLASSES: 08
Student t-distribution, its properties; Test of significance sample mean and population mean, difference between means of two small samples. Snedecor's F- distribution and its properties. Test of equality of two population variances. Chi-square distribution, its properties, Chi-square test of goodness of fit. One way ANOVA		
UNIT - V	STOCHASTIC PROCESSES AND MARKOV CHAINS	CLASSES: 08
Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.		
TEXT BOOKS		
<ol style="list-style-type: none"> 1. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers, 36th Edition, 2010. 2. Probability and Statistics for Engineers by Richard Arnold Johnson, Irwin Miller and John E. Freund, New Delhi, Prentice Hall. 3. Probability and Statistics for Engineers and Sciences by Jay L. Devore, Cengage Learning 		
REFERENCE BOOKS		
<ol style="list-style-type: none"> 1. Ervin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 2. Fundamentals of Mathematical Statistics by S.C. Gupta&V.K. Kapoor, S. Chand 3. Introduction to Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press 		
WEB REFERENCES		
<ol style="list-style-type: none"> 1. https://www.efunda.com/math/math_home/math.cfm 2. https://www.ocw.mit.edu/resources/#Mathematics 3. https://www.sosmath.com/ 4. https://www.mathworld.wolfram.com/ 		
E-TEXT BOOKS		
1. https://www.e-booksdirectory.com/details.php?ebook=10166		
MOOCS COURSE		
<ol style="list-style-type: none"> 1. https://swayam.gov.in/ 2. https://onlinecourses.nptel.ac.in/ 		

DIGITAL ELECTRONICS AND COMPUTER ORGANIZATION

II B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		CIE	SEE	Total
A6CS28	ESC	3	-	-	3	40	60	100

COURSE OBJECTIVES

The course should enable the students to:

1. Understand different number systems and Boolean Algebra.
2. Design of combinational and sequential logic circuits
3. Understand different Computer Instructions and addressing modes
4. Understand concepts of register transfer logic and arithmetic operations.
5. Learn different types of memory hierarchy

COURSE OUTCOMES

1. Apply minimization techniques to simplify Boolean expressions.
2. Apply the principles of Digital electronics to design combinational and sequential logic circuits.
3. Understand the basics of instruction set and their impact on processor design
4. Illustrate register transfer operations
5. Analyze memory hierarchy and I/O Communication.

UNIT - I	NUMBER THEORY and BOOLEAN ALGEBRA	CLASSES: 12
Representation of numbers of different radix, conversion of numbers from one radix to another radix, r-1's complement and r's complement. 4-bit codes. Basic Theorems and Properties of Boolean algebra, Canonical and Standard Forms, Digital Logic Gates, Universal Logic Gates. K- Map Method, Implementation using NAND and NOR gates.		
UNIT - II	DESIGN OF COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS	CLASSES: 14
Design of full adder, full subtractor, Decoder, Encoder, Multiplexer, De-multiplexer and comparator. Latches, flip-flops, truth tables and excitation tables. Design of Ripple counters, design of synchronous counters, Johnson counter, ring counter, shift registers.		
UNIT - III	BASIC COMPUTER ORGANIZATION AND DESIGN	CLASSES: 16
Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-Output and interrupt. Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC), Reduced Instruction Set Computer (RISC).		
UNIT - IV	REGISTER TRANSFER AND MICRO-OPERATIONS	CLASSES: 16
Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logic shift unit. Pipeline and Parallel Processing: Parallel processing, Pipelining, Arithmetic pipeline, Instruction pipeline.		
UNIT - V	MEMORY SYSTEM	CLASSES: 16

INPUT-OUTPUT ORGANIZATION: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA.

MEMORY ORGANIZATION: Memory Hierarchy, Main memory, Auxiliary memory, Associate memory, Cache memory.

TEXT BOOKS

1. Digital Design- Morris Mano, PHI, 3rd Edition.
2. Digital Principles and Applications by Leach, Paul Malvino, 5th Edition.
3. Computer System Architecture- M. Morris Mano, 3rd edition, Pearson/PHI, India.

REFERENCE BOOKS

1. Switching and Finite Automata Theory by Zvi.Kohavi, Tata McGraw Hill.
2. Fundamentals of Digital circuits, A. Anand Kumar, Third Edition, 2013, PHI.
3. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson

DATA STRUCTURES

II B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		CIE	SEE	Total
A6CS05	ESC	3	-	-	3	40	60	100

COURSE OBJECTIVES

1. Exploring basic data structures such as stacks and queues.
2. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
3. Introduces sorting and pattern matching algorithms

COURSE OUTCOMES

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

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

UNIT - I

Linear Data Structures – Stack, Queue, Linked List

CLASSES: 15

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Operations, array and linked representations of stacks, stack applications, Queues- operations, array and linked representations.

UNIT - II

Dictionaries and Hash Structures

CLASSES: 15

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching. Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing- linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT - III

Search Trees

CLASSES: 12

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B- Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

UNIT - IV

Graph and Sorting Techniques

CLASSES: 12

Graphs: Graph Implementation Methods. Graph Traversal Methods.
Sorting: Quick Sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

UNIT - V

Pattern Matching

CLASSES: 10

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXT BOOKS

1. Fundamentals of Data Structures in C, 2 nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

REFERENCE BOOKS

1. Data Structures: A Pseudo code Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning.

WEB REFERENCES

1. <https://hackr.io/tutorials/learn-data-structures-algorithms>
2. <https://www.geeksforgeeks.org/fundamentals-of-algorithms/>
3. <https://www.udemy.com/introduction-to-algorithms-and-data-structures-in-c/>
4. <https://leetcode.com>

OBJECT ORIENTED PROGRAMMING USING JAVA

II B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6IT02	PCC	L	T	P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

COURSE OBJECTIVES

The course should enable the students to

1. Use object oriented programming concepts to solve real world problems.
2. Demonstrate the user defined exceptions by exception handling keywords (try, catch, throw, throws and finally).
3. Use multithreading concepts to develop inter process communication.
4. Develop java application to interact with database by using relevant software component (JDBC Driver).
5. Solve real world problems using Collections

COURSE OUTCOMES

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

1. Use object oriented programming concepts to solve real world problems.
2. Demonstrate the user defined exceptions by exception handling keywords (try, catch, throw, throws and finally).
3. Use multithreading concepts to develop inter process communication.
4. Develop java application to interact with database by using relevant software component (JDBC Driver).
5. Build the internet-based dynamic applications using the concept of applets

UNIT - I	JAVA BASICS	CLASSES: 12
<p>JAVA BASICS: Review of Object oriented concepts, History of Java, Java buzzwords, JVM architecture, Data types, Variables, Scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors, methods, Static block, Static Data, Static Method, String and String Buffer Classes, Using Java API Document.</p>		
UNIT - II	INHERITANCE, POLYMORPHISM, PACKAGES AND INTERFACES	CLASSES: 11
<p>INHERITANCE AND POLYMORPHISM: Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading, Method overriding, Abstract classes, Encapsulation, Need for encapsulation in java, Data hiding vs Encapsulation, getter and setter methods, Dynamic method dispatch, Usage of final keyword.</p> <p>PACKAGES AND INTERFACES: Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces</p>		
UNIT - III	EXCEPTION HANDLING AND FILES	CLASSES: 10

<p>EXCEPTION HANDLING: Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes.</p> <p>I / O STREAMS AND FILES: Concepts of streams, Stream classes- Byte and Character stream, Reading console Input and Writing Console output, IO/Serialization, File Handling,</p>		
UNIT – IV	MULTITHREADING AND JDBC	CLASSES: 10
<p>MULTI THREADING: Concepts of Thread, Thread life cycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication, Concurrency, Executors framework</p> <p>JDBC-Connecting to Database - JDBC Type 1 to 4 drives, connecting to a database, querying a Database and processing the results, updating data with JDBC</p>		
UNIT - V	COLLECTION FRAMEWORK	CLASSES: 10
<p>COLLECTION FRAMEWORK: 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, Lambdas & Functional Interfaces</p>		
TEXT BOOKS		
<ol style="list-style-type: none"> 1. Herbert Schildt and Dale Skrien, Java Fundamentals – A comprehensive Introduction , McGraw Hill, 1st Edition, 2013. 2. Herbert Schildt, —Java the complete referencell, McGraw Hill, Osborne, 7th Edition, 2011. 3. T.Budd, —Understanding Object- Oriented Programming with Javall, Pearson Education, Updated Edition (New Java 2 Coverage), 1999. 		
REFERENCE BOOKS		
<ol style="list-style-type: none"> 1. P.J.Dietel and H.M.Dietel , —Java How to program , Prentice Hall, 6th Edition, 2005. 2. P.Radha Krishna , —Object Oriented programming through Javall, CRC Press, 1st Edition, 2007. 3. S.Malhotra and S. Choudhary, —Programming in Javall, Oxford University Press, 2nd Edition, 2014. 		

SOFTWARE ENGINEERING

II B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6CS07	PCC	L	T	P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

COURSE OBJECTIVES

1. The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
2. Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

COURSE OUTCOMES

1. Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
2. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

UNIT - I

INTRODUCTION TO SOFTWARE ENGINEERING

CLASSES: 10

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

UNIT - II

SOFTWARE REQUIREMENTS & REQUIREMENTS ENGINEERING PROCESS

CLASSES: 10

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

UNIT - III

DESIGN ENGINEERING

CLASSES: 10

Design Engineering: Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT – IV

TESTING STRATEGIES

CLASSES: 10

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. Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT - V	RISK MANAGEMENT & QUALITY MANAGEMENT	CLASSES: 10
<p>Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.</p>		
<p>TEXT BOOKS</p>		
<ol style="list-style-type: none"> 1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition. 2. Software Engineering- Sommerville, 7th edition, Pearson Education. 		
<p>REFERENCE BOOKS</p>		
<ol style="list-style-type: none"> 1. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education. 2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley. 3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies. 4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education. 		

DATA STRUCTURES LAB

II B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		CIE	SEE	Total
A6CS06	ESC	-	-	3	1.5	40	60	100

COURSE OBJECTIVES

The course should enable the students to:

1. It covers various concepts of C programming language
2. It introduces searching and sorting algorithms
3. It provides an understanding of data structures such as stacks and queues.

COURSE OUTCOMES

The course should enable the students to:

1. Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
2. Ability to Implement searching and sorting algorithms

LIST OF EXPERIMENTS

WEEK -1	STACK OPERATIONS
1. Write a program that implement stack (its operations) using i) Arrays ii)Pointers	
WEEK -2	QUEUE OPERATIONS
2. Write a program that implement Queue (its operations) using i) Arrays ii) Pointers	
WEEK -3	SINGLYLINKEDLIST
3. Write a program that uses functions to perform the following operations on singly linked list.: i) Creation ii) Insertion iii) Deletion iv) Traversal	
WEEK -4	DOUBLYLINKEDLIST
4. Write a program that uses functions to perform the following operations on doubly linked list.: i) Creation ii) Insertion iii) Deletion iv) Traversal	
WEEK -5	CIRCULAR LINKED LIST
5. Write a program that uses functions to perform the following operations on circular linked list. i) Creation ii) Insertion iii) Deletion iv) Traversal	
WEEK -6	SORTING TECHNIQUES

6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order i) Quick sort ii) Heap sort	
WEEK -7	SORTING TECHNIQUES
7. Write a program that implements the following sorting methods to sort a given list of integers in ascending order iii) Merge sort iv) Selection sort	
WEEK -8	TREE TRAVERSALS
8. Write a program to implement the tree traversal methods (Recursive and Non Recursive). i) Pre-order ii) In order iii) Post order iv) tree display	
WEEK -9	BINARY SEARCH TREES
9. Write a program to implement i) Binary Search tree ii) B Trees	
WEEK -10	BINARY SEARCH TREES
10. Write a program to implement iii) B+ Trees iv) AVL trees v) Red - Black trees	
WEEK -11	GRAPH TRAVERSAL
11. Write a program to implement the graph traversal methods. i) DFS ii) BFS	
WEEK -12	
12. Implement a Pattern matching algorithms using Boyer- Moore, Knuth-Morris-Pratt	
TEXT BOOKS	
1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press. 2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.	

OBJECT ORIENTED PROGRAMMING USING JAVA LAB

II B. TECH- I SEMESTER								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6IT03	PCC	L	T	P	C	CIE	SEE	Total
		-	-	3	1.5	40	60	100
<p>COURSE OUTCOMES</p> <p>At the end of the course, student will be able to:</p> <ol style="list-style-type: none"> 1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity. 2. Understand the use of different exception handling mechanisms and concept of multithreading for robust and efficient application development. 3. Understand and implement concepts on file streams and operations in java programming for a a given application programs. 4. Develop java application to interact with database by using relevant software component (JDBC Driver). 								
LIST OF EXPERIMENTS								
WEEK - 1	JAVABASICS							
<ol style="list-style-type: none"> a. Write a java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula. b. The Fibonacci sequence is defined by the following rule. The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a java program that uses both recursion and non-recursion functions. 								
WEEK - 2	ARRAYS							
<ol style="list-style-type: none"> a. Write a java program to sort given list of integers in ascending order. b. Write a java program to multiply two given matrices. 								
WEEK - 3	STRINGS							
<ol style="list-style-type: none"> a. Write a java program to check whether a given string is palindrome. b. Write a java program for sorting a given list of names in ascending order. 								
WEEK - 4	OVERLOADING & OVERRIDING							
<ol style="list-style-type: none"> a. Write a java program to implement method overloading and constructors overloading. b. Write a java program to implement method overriding. 								
WEEK - 5	INHERITANCE							
<p>Write a java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area() that prints the area of the given shape.</p>								
WEEK - 6	INTERFACES							

- a. Write a program to create interface A in this interface we have two method meth1 and meth2. Implements this interface in another class named MyClass.
- b. Write a program to give example for multiple inheritance in Java.

WEEK - 7	EXCEPTION HANDLING
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Write a program that reads two numbers Num1 and Num2. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception.

WEEK - 8	I/O STREAMS
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- a. Write a java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

WEEK - 9	MULTI THREADING
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Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number

WEEK - 10	GENERICS
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- a. Write a Java program to swap two different types of data using Generics.
- b. Write a Java program to find maximum and minimum of two different types of data using Generics.

WEEK - 11	COLLECTIONS
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Create a linked list of elements.

- a. Delete a given element from the above list.
- b. Display the contents of the list after deletion

WEEK - 12	CONNECTING TO DATABASE
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Write a java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.

TEXT BOOKS

1. P.J.Dietel and H.M.Dietel , —Java How to programII, Prentice Hall, 6th Edition, 2005.
2. P.Radha Krishna , —Object Oriented programming through Javall, CRC Press, 1st Edition, 2007.
3. S.Malhotra and S. Choudhary, —Programming in Javall, Oxford University Press, 2nd Edition, 2014.

SKILL DEVELOPMENT (DATA VISUALIZATION USING R)

II B. TECH- I SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		CIE	SEE	Total
A6CS52	SKL	0	0	2	1	40	60	100

COURSE OBJECTIVES

1. Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
2. To discern patterns and relationships in the data.
3. To build Dashboard applications.
4. To communicate the results clearly and concisely.
5. To be able to work with different formats of data sets.

COURSE OUTCOMES

At the end of the course a student should be able to

1. Understand How to import data into Tableau.
2. Understand Tableau concepts of Dimensions and Measures.
3. Develop Programs and understand how to map Visual Layouts and Graphical Properties.
4. Create a Dashboard that links multiple visualizations.
5. Use graphical user interfaces to create Frames for providing solutions to real world problems

WEEK - 1

1. Understanding Data, what is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?

WEEK - 2

2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts(line, bar charts, Tree maps),Using the Show me panel.

WEEK - 3

3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.

WEEK - 4

4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.

WEEK - 5

5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.

WEEK - 6

6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data		
WEEK - 7		
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.		
WEEK - 8		
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.		
WEEK - 9		
9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting		
WEEK - 10		
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.		
TEXT BOOKS		
<ol style="list-style-type: none"> 1. R in Action By - Robert L. Kabacoff, Second Edition - Publisher - Dreamtech Press 2. R for Data Science, By - Hadley Wickham and Garrett Gorlemund, O'Reilly 		
REFERENCE BOOKS		
<ol style="list-style-type: none"> 1. R Programming for Data Science by Roger D. Peng (References) 2. The Art of R Programming by Norman Matloff Cengage Learning India. 		

GENDER SENSITIZATION

II B. TECH- I SEMESTER								
Course Code	Category	Hours /Week			Credits	Maximum Marks		
A6HS05	MC	L	T	P	C	CIE	SEE	Total
		-	-	2	0	40	60	100
Contact Classes:16		Tutorial Classes: 0		Practical Classes:00		Total Classes:16		
COURSE OUTCOMES								
<ol style="list-style-type: none"> Students will have developed a better understanding of important issues related to gender in contemporary India. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labour and its relation to politics and economics. Men and women students and professionals will be better equipped to work and live together as equals. Students will develop a sense of appreciation of women in all walks of life. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence. 								
UNIT - I	UNDERSTANDING GENDER: Gender:							
UNDERSTANDING GENDER: Gender: Why Should We Study It? (Towards a World of Equals: Unit -1) Socialization: Making Women, Making Men (Towards a World of Equals: Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities								
UNIT - II	GENDER AND BIOLOGY: Missing Women							
GENDER AND BIOLOGY: Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit - 4)Declining Sex Ratio. Demographic Consequences. Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10)Two or Many? Struggles with Discrimination								
UNIT - III	GENDER AND LABOUR							
GENDER AND LABOUR: Housework: the Invisible Labour (Towards a World of Equals: Unit -3) “My Mother doesn’t Work.” “Share the Load.” Women’s Work: Its Politics and Economics (Towards a World of Equals: Unit -7) Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.								
UNIT - IV	ISSUES OF VIOLENCE							
ISSUES OF VIOLENCE: Sexual Harassment: Say No! (Towards a World of Equals: Unit -6) Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading:“Chupulu”. Domestic Violence: Speaking Out (Towards a World of Equals: Unit -8) Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice. Thinking about Sexual Violence (Towards a World of Equals: Unit -11) Blaming the Victim-“I Fought for my Life....” - Additional Reading: The Caste Violence								

UNIT - V	GENDER: CO – EXISTENCE: Just Relationships	
<p>GENDER: CO – EXISTENCE: Just Relationships: Being Together as Equals (Towards a World of Equals: Unit -12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers Additional Reading: Rosa Parks-The Brave Heart</p>		
<p>TEXT BOOKS</p>		
<p>1. All the five Units in the Textbook, “Towards a World of Equals: A Bilingual Textbook on Gender” written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad, Telangana State in the year 2015.</p>		
<p>REFERENCE BOOKS</p>		
<p>1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012 2. Abdulali Sohaila. “I Fought For My Life...and Won.” Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdul/</p>		

II B.TECH II SEMESTER SYLLABUS

DISCRETE MATHEMATICS

II B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		CIE	SEE	Total
A6CS08	BSC	3	-	-	3	40	60	100

COURSE OBJECTIVES

The course should enable the students to:

1. To help students understand discrete and continuous mathematical structures
2. To impart basics of relations and functions
3. To facilitate students in applying principles of Recurrence Relations to calculate generating
4. Functions and solve the Recurrence relations
5. To acquire knowledge in graph theory

COURSE OUTCOMES

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

1. Analyze and examine the validity of argument by using propositional and predicate calculus
2. Apply basic counting techniques to solve the combinatorial problems
3. Apply sets relations and digraphs to solve applied problems
4. Solve the given recurrence relation using different methods such as substitution, Generating function and characteristics roots equation.
5. Use the basic concepts of graph theory and some related theoretical problems

UNIT - I	MATHEMATICAL LOGIC	CLASSES: 11
Statements and notations, Connectives, Well formed formulas, Truth Tables, Tautology, Equivalence implication, Normal forms, Logical Inference, Rules of inference, Direct Method, Direct Method using CP(Conditional Proof), Consistency, Proof of contradiction, Automatic Theorem Proving.		
UNIT - II	RELATIONS	CLASSES: 16
Introduction to set theory, Relations, Properties of Binary Relations, Equivalence Relation, Transitive closure, Compatibility and Partial ordering relations, Lattices, Hasse diagram. Functions: inverse Function , Composition of functions. Algebraic Systems, Semi groups and Monoids		
UNIT - III	ELEMENTARY COMBINATORICS	CLASSES: 12
Basis of counting, Combinations & Permutations, Enumeration of Combinations and Permutations, Enumeration of Combinations and Permutations With repetitions, Enumerating Permutations with Constrained repetitions, Binomial Coefficients, Binomial and Multinomial theorems, The principles of Inclusion – Exclusion, Pigeon- hole principles and its applications.		
UNIT - IV	RECURRENCE RELATION	CLASSES: 11
Generating Functions, Function of Sequences, Calculating Coefficient of generating function, Recurrence relations, Solving recurrence relation by substitution and Generating functions , The method of Characteristics roots,		
UNIT - V	GRAPH THEORY	CLASSES: 10

Basic Concepts, Isomorphism and Subgraphs, Trees and their properties, Spanning Trees- DFS,BFS, Minimal Spanning Trees- Prims, Kruskal's Algorithm, Planar Graphs, Euler's Formula, Multi graph and Euler circuits, Hamiltonian Graphs, Chromatic number.

TEXT BOOKS

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe I. Mott, Abraham Kandel, Theodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

II B. TECH- II SEMESTER

Course Code	Category	Hours /Week			Credits	Maximum Marks		
A6HS08	HSMC	L	T	P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

COURSE OBJECTIVES

To enable the student to understand and appreciate, with a particular insight, the importance of certain basic issues governing the business operations namely; demand and supply, production function, cost analysis, markets, forms of business organizations, capital budgeting and financial accounting and financial analysis.

COURSE OUTCOMES

At the end of the course, the student will

1. Understand the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures.
2. Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis.
3. Develop an understanding of
4. Analyze how capital budgeting decisions are carried out.
5. Understanding the framework for both manual and computerized accounting process
6. Know how to analyze and interpret the financial statements through ratio analysis.

UNIT - I	Introduction & Demand Analysis	
Introduction & Demand Analysis: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.		
UNIT - II	Production & Cost Analysis	
Production & Cost Analysis: Production Function - Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts. Break-even Analysis (BEA)- Determination of Break-Even Point (simple problems) - Managerial Significance.		
UNIT - III	Markets & New Economic Environment	
Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Pricing: Objectives and Policies of Pricing. Methods of Pricing. Business: Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, New Economic Environment: Changing Business Environment in Post-liberalization scenario.		
UNIT - IV	Capital Budgeting	

Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital - Trading Forecast, Capital Budget, Cash Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of return (ARR) and Net Present Value Method (simple problems).		
UNIT - V	Introduction to Financial Accounting & Financial Analysis	
Accounting concepts and Conventions - Introduction IFRS - Double - Entry Book Keeping, Journal, Ledger, and Trial Balance - Final Accounts (Trasing Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.		
TEXTBOOKS		
<ol style="list-style-type: none"> 1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009. 2. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2013. 3. M. Kasi Reddy & Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2012. 		
REFERENCEBOOKS		
<ol style="list-style-type: none"> 1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi, 2012. 2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012. 3. Lipsey & Chrystel, Economics, Oxford University Press, 2012. 4. Domnick Salvatore: Managerial Economics In a Global Economy, Thomson, 2012. 5. Narayanaswamy: Financial Accounting - A Managerial Perspective, Pearson, 2012. 6. S.N. Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012. 7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012. 8. Dwivedi: Managerial Economics, Vikas, 2012. 9. Shailaja & Usha: MEFA, University Press, 2012. 10. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012. 11. Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011. 12. J.V. Prabhakar Rao & P.V. Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011. 		

DATABASE MANAGEMENT SYSTEMS

II B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6CS09	PCC	L	T	P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

COURSE OBJECTIVES

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

COURSE OUTCOMES

- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

UNIT - I	DATABASE SYSTEM APPLICATIONS & INTRODUCTION TO DATABASE DESIGN	CLASSES: 10
<p>Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS</p> <p>Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model</p>		
UNIT - II	INTRODUCTION TO THE RELATIONAL MODEL	CLASSES: 10
<p>Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus</p>		
UNIT - III	SQL & SCHEMA REFINEMENT	CLASSES: 10
<p>SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.</p> <p>Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.</p>		
UNIT - IV	TRANSACTION CONCEPT	CLASSES: 10
<p>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, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions.</p>		
UNIT - V	DATA ON EXTERNAL STORAGE	CLASSES: 10

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

TEXT BOOKS

1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

REFERENCE BOOKS

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition

OPERATING SYSTEMS

II B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6CS11	PCC	L	T	P	C	CIE	SEE	Total
		3	-	-	3	40	60	100

COURSE OBJECTIVES

1. To explain main components of OS and their working
2. To familiarize the operations performed by OS as a resource Manager
3. To familiarize with Dead Locks
4. To impart various scheduling policies of OS
5. To teach the different memory management techniques.

COURSE OUTCOMES

1. Analyze the different structures and services of operating system.
2. Analyze various algorithms used for OS services with respect to defined/chosen criteria.
3. Solve the resource allocation and sharing problems.
4. Assess different methods to solve OS problems.
5. Analyze the memory management approaches of operating systems.

UNIT - I OPERATING SYSTEMS OVERVIEW

CLASSES: 14

OPERATING SYSTEMS OVERVIEW: Introduction, operating system operations, process management, memory management, storage management, protection and security, distributed systems.

OPERATING SYSTEMS STRUCTURES: Operating system services and systems calls, system programs, operating system structure, operating systems generations

UNIT - II PROCESS MANAGEMENT

CLASSES: 16

PROCESS MANAGEMENT: Process concepts, process state, process control block, scheduling queues, process scheduling, Scheduling algorithms, multithreaded programming.

CONCURRENCY AND SYNCHRONIZATION: Process synchronization, critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of synchronization, readers and writers problem, dining philosophers problem, monitors, synchronization examples(Solaris).

UNIT - III DEAD LOCKS

CLASSES: 14

DEADLOCKS: System model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock banker's algorithm.

MEMORY MANAGEMENT: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms, allocation of frames, thrashing.

UNIT - IV FILE SYSTEM

CLASSES: 12

FILE SYSTEM: Concept of a file, access methods, directory structure, file system mounting, file sharing, protection.

File system implementation: file system structure, file system implementation, directory implementation, allocation methods, free-space management, efficiency and performance.

UNIT - V MASS STORAGE STRUCTURE

CLASSES: 14

MASS STORAGE STRUCTURE: overview of mass storage structure, disk structure, disk attachment, disk scheduling algorithms, swap space management, stable storage implementation, tertiary storage structure.
I/O: Hardware, application I/O interface, kernel I/O subsystem, transforming I/O requests to hardware operations, streams, performance

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, William Stallings, Fifth Edition–2005, Pearson Education/PHI
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.

SOFTWARE TESTING FUNDAMENTALS

II B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		CIA	SEE	Total
A6CS13	PCC	3	-	-	3	40	60	100

COURSE OBJECTIVES:

To learn Software Testing has different goals and objectives.

1. Finding defects which may get created by the programmer while developing the software.
2. Gaining **confidence** in and providing information about the level of quality.
3. To prevent defects.

COURSE OUTCOMES:

Upon successful completion of the course, the student is able to

1. Understand software testing methods
2. apply various software testing techniques
3. Design and conduct a software test process for a software testing project
4. Designing solutions for various software testing problems by selecting appropriate software test model
5. Implement various practice oriented software testing projects

UNIT-I INTRODUCTION

CLASSES: 08

Basics of software testing, Testing objectives, Principles of testing, Test Life Cycle, Types of testing, Software defect tracking.

UNIT-II TESTING METHODOLOGIES

CLASSES: 12

White Box And Black Box Testing, Static Testing, Static Analysis Tools, Structural Testing, Unit/Code functional, testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing.

UNIT-III INTEGRATION TESTING

CLASSES: 10

Integration, System, and Acceptance Testing Top down and Bottom up integration, Functional versus Non-functional testing, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing

UNIT-IV TEST SELECTION & MINIMIZATION FOR REGRESSION TESTING

CLASSES: 10

Test Selection & Minimization for Regression Testing Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

UNIT-V TEST MANAGEMENT AND AUTOMATION TEST PLANNING

CLASSES: 10

Test Management and Automation Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection.

TEXT BOOKS

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.

REFERENCE BOOKS

1. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
2. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

DATABASE MANAGEMENT SYSTEMS LAB

II B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6CS10	PCC	L	T	P	C	CIE	SEE	Total
		-	-	3	1.5	40	60	100

COURSE OBJECTIVES

The course should enable the students to:

1. Apply the basic concepts of Database Systems and Applications.
2. Use the basics of SQL and construct queries using SQL in database creation and interaction
3. Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
4. Analyze and Select storage and recovery techniques of database system.

COURSE OUTCOMES

The course should enable the students to:

1. Apply the basic concepts of Database Systems and Applications.
2. Develop an ER model for a given database.
3. Use the basics of SQL and construct queries using SQL in database creation and interaction.
4. Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
5. Analyze and Select storage and recovery techniques of database system.

LIST OF EXPERIMENTS

WEEK - 1 DDL Commands

Creation of Tables using SQL-Overview of using SQL tool and Data types in SQL

1. Altering Tables and
2. Dropping Tables

WEEK - 2 Create Table with Primary key and Foreign Key & DML Commands

Creating Tables(along with Primary and Foreign keys),Practicing DML commands-

- 1) Insert
- 2) Update
- 3) Delete

WEEK - 3 Selection Queries

Practicing Select command using following operations

- 1) AND,OR
- 2) ORDERBY
- 3) BETWEEN
- 4) LIKE
- 5) Apply CHECK constraint

WEEK - 4	AGGREGATE FUNCTIONS and Views
<p>Practice Queries using following functions</p> <ol style="list-style-type: none"> 1) COUNT 2) SUM 3) AVG 4) MAX 5) MIN <p>Apply constraint on aggregation using</p> <ol style="list-style-type: none"> 1) GROUPBY 2) HAVING a. VIEWS Create, Modify and Drop 	
WEEK - 5	Nested QUERIES
<p>Practicing Nested Queries using UNION,</p> <ol style="list-style-type: none"> 1) INTERSECT, 2) CONSTRAINTS 3) IN 	
WEEK - 6	CO-RELATEDNESTEDQUERIES
<p>Practicing Co – Related Nested Queries using</p> <ol style="list-style-type: none"> 1) EXISTS a. NOT EXISTS, ANY,ALL 	
WEEK - 7	JOINQUERIES
<p>Practicing Join Queries using</p> <ol style="list-style-type: none"> 1) Inner join 2) Outer join 3) Equi join 4) Natural join 	
WEEK - 8	TRIGGERS
<p>Practicing Triggers Creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger.</p>	
WEEK - 9	PROCEDURES
<p>Procedures-Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure</p>	
WEEK - 10	CURSORS
<p>Cursors-Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor</p>	
WEEK - 11	PL/SQL Part 1

Practice PL/SQL	
<ol style="list-style-type: none"> 1) Block structure 2) Variables 3) data types 	
WEEK - 12	PL/SQL Part 2
Practice PL/SQL	
<ol style="list-style-type: none"> 1) operators 2) control structures 	
<p>Case study 1: College Management</p> <p>Case study 2: An Enterprise/Organization</p> <p>Case study 3 : Library Management system</p> <p>Case study 4: Sailors and shipment</p>	
TEXT BOOKS	
<ol style="list-style-type: none"> 1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition 2. Database System Concepts, Silberschatz, Korth, McGraw Hill, 5th edition. 	
REFERENCE BOOKS	
<ol style="list-style-type: none"> 1. Database Systems design, Implementation, and Management, PeterRob & Carlos Coronel 7th Edition. 2. Fundamentals of Database Systems, ElmasriNavrate, Pearson Education 3. Introduction to Database Systems, C.J.Date, Pearson Education 4. Oracle for Professionals, The XTeam, S.Shah and V.Shah, SPD. 5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI. 6. Fundamentals of Database Management Systems, M.L. Gillenson,Wiley Student Edition. 	

OPERATING SYSTEMS LAB

II B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
A6CS12	PCC	L	T	P	C	CIE	SEE	Total
		-	-	3	1.5	40	60	100

COURSE OBJECTIVES

1. To provide an understanding of the design aspects of operating system concepts through simulation
2. Introduce basic Unix commands, system call interface for process management, Inter-process communication and I/O in Unix

COURSE OUTCOMES

1. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
2. Able to implement C programs using Unix system calls

LIST OF EXPERIMENTS

WEEK - 1

Write C programs to simulate the following CPU Scheduling algorithms
a) FCFS b) SJF

WEEK - 2

Write C programs to simulate the following CPU Scheduling algorithms
a) Round Robin b) priority

WEEK - 3

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

WEEK - 4

Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention

WEEK - 5

Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.

WEEK - 6

Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs

WEEK - 7

Write C programs to illustrate the following IPC mechanisms
a) Message Queues b) Shared Memory

WEEK - 8	
Write C programs to simulate the following memory management techniques a) Paging b) Segmentation	
WEEK - 9	
Write C programs to simulate Page replacement policies a) FCFS	
WEEK - 10	
Write C programs to simulate Page replacement policies a) LRU	
WEEK - 11	
Write C programs to simulate Page replacement policies a) Optimal	
TEXT BOOKS	
<ol style="list-style-type: none"> 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, Pears 	
REFERENCE BOOKS	
<ol style="list-style-type: none"> 1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI 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 	

SKILL DEVELOPMENT COURSE (HTML,XML,JAVASCRIPT,NODEJS)

II B. TECH- II SEMESTER

Course Code:	Category	Hours / Week			Credits	Maximum Marks		
A6CS53	SKL	L	T	P	C	CIE	SEE	Total
		0	0	2	1	40	60	100

COURSEOBJECTIVES

1. Teach Students to build static web pages using HTML and CSS
2. Explain web application development procedures
3. Facilitate students to build dynamic, responsive web pages using Angular JS
4. Teach students the basics of server side scripting using PHP
5. Familiarize various concepts Java Framework Strucrts.

COURSEOUTCOMES

At the end of the course a student should be able to

1. Use HTML and CSS to design web pages.
2. Infer the role of XML in web applications and use them.
3. Apply the concepts of JavaScript to perform client side validation and create dynamic web pages.
4. Create server side applications using PHP.
5. Create web application using AngularJS that depend on MVC architecture.
6. Understand the concept of Strucrts framework.

WEEK - 1

Note:

1. Apache, MySQL and PHP for the Lab Experiments. Though not mandatory, encourage the use of Eclipse platform wherever applicable
2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed
 1. Install the following on the local machine
 2. Apache Web Server (if not installed)
 3. Tomcat Application Server locally
 4. Install MySQL (if not installed)
 5. Install PHP and configure it to work with Apache web server and MySQL (if not already configured)

WEEK - 2

2. Write a HTML Page to create a Student registration form that collects various student information such as first name, last name, Roll No., email id, mobile number, etc and a two buttons: submit and reset. Apply different CSS properties

WEEK - 3

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

WEEK - 4	
4. Create an XMLHttpRequest to retrieve data from an XML file and display the data in an HTML table.	
WEEK - 5	
5. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).	
WEEK - 6	
6. Write an HTML page that has one input, which can take multi-line text and a submit button. Once the user clicks the submit button, it should show the number of characters, words and lines in the text entered using an alert message. Words are separated with while space and lines are separated with new line character.	
WEEK - 7	
7. Implement the following web applications using AngularJS: A simple calculator web application that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands	
WEEK - 8	
8. Create a Angular JS Application to make a shopping list where you can add or remove items.	
WEEK - 9	
9. Implement the following web applications using AngularJS: A user validation web application, where the user submits the login name and password to the server. The name and password are checked if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.	
WEEK - 10	
10. Write an HTML page including any required PHP that takes a number from one text field in the range of 0 to 999 and shows it in range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.	
WEEK - 11	
11. Implement the following web applications using PHP: A user validation web application, where the user submits the login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.	
WEEK - 12	
12. A web application that lists all cookies stored in the browser on clicking "List Cookies" button.Add cookies if necessary.	
TEXT BOOKS	

1. Web Technologies, Uttam K Roy, Oxford University Press, 2010
2. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill 3rd Edition

REFERENCE BOOKS

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

SKILL DEVELOPMENT COURSE (MOBILE APPLICATION DEVELOPMENT)

II B. TECH- II SEMESTER								
Course Code:	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIE	SEE
A6CS53	SKL	0	0	2	1	40	60	100
<p>COURSE OBJECTIVES</p> <p>1. To enable students to develop mobile applications</p> <p>COURSE OUTCOMES</p> <p>At the end of the course a student should be able to</p> <ol style="list-style-type: none"> Identify various concepts of mobile programming that make it unique from programming for other platforms Critique mobile applications on their design pros and cons. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces. Program mobile applications for the Android operating system that use basic and advanced phone features. Deploy applications to the Android marketplace for distribution. 								
WEEK - 1								
1. Build and Run first ANDROID Hello World program in Emulator and work with Layouts and UI								
WEEK - 2								
2. Design Count App which Increments and Decrements Count Value by 1 in Text View								
WEEK - 3								
3. (a) Create an Android Application for registration form using Relative Layout and perform its validation (b) Design Color Changer Mobile with atleast three colors								
WEEK - 4								
4. (a) Create an Android Application for currency converter. (b) Design Android APP to demonstrate Activity Life Cycle States								
WEEK - 5								
5. (a) Create an App that simulates sample ATM operations: Balance Enquiry, Deposit , Withdraw . (b) Design Android APP using Image View and Rotate Animations								
WEEK - 6								
6. Create an Android Application for calculator								
WEEK - 7								

7. (a) Create App for visiting a web url using implicit intent (b) Create App for navigating from one activity to another activity using Explicit Intent	
WEEK - 8	
8. (a) Develop an APP which plays Video files (b) Design Android APP for Sharing Implicit Intent	
WEEK - 9	
9. Create an App to Identify the Current Location using GOOGLE MAP API	
WEEK - 10	
10. (a) Create Slide Show of Multiple Images using Android APP (b) Create an APP for Login Authentication using Firebase	
WEEK - 11	
11. Create an APP to insert and retrieve data from SQLite database	
WEEK - 12	
(a) Create an APP which performs authentication of registration form using Firebase (b) Design Layouts for Online Quiz App	
TEXT BOOKS	
<ol style="list-style-type: none"> 1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011) 2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd 	
REFERENCE BOOKS	
<ol style="list-style-type: none"> 1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd 2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd 3. Android Application Development All in one for Dummies by Barry Burd, Edition: I 	

CONSTITUTION OF INDIA

II B. TECH- II SEMESTER

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		CIE	SEE	Total
A6HS06	MC	L	T	P	C	CIE	SEE	Total
		-	-	2	0	40	60	100

COURSE OBJECTIVES

Students will be able to:

1. Understand the need for constitution
2. Appreciate the fundamental duties and rights of the citizens of India.
3. Explain the role and amendments of constitution in a democratic society.
4. Describe the directive principles of state policy and their significance.
5. List the key features of the constitution, union government and state government.

COURSE OUTCOMES

Students will be able to:

1. Create awareness about the constitutional values and objectives written in the Indian constitution.
2. List fundamental rights and fundamental duties of Indian citizens.
3. Identify the division of legislative, executive and financial powers between the union and state governments.
4. Understand the working of Indian democracy, its institutions and processes at the local, state and union levels.
5. Explain the functions and responsibilities of election commission of india and union public service commission.

UNIT - I HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History of Making of the Indian Constitution: Introduction to the constitution of India, the making of the constitution and salient features of the constitution.

UNIT - II PHILOSOPHY OF THE INDIAN CONSTITUTION

Philosophy of the Indian Constitution: Preamble Salient Features, Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties, Amendment of the constitutional powers and procedures.

UNIT - III UNION GOVERNMENT

Union Government: Union Government, Union Legislature (Parliament), Lok Sabha and Rajya Sabha (with powers and functions), president of India (with powers and functions), Prime minister of India (With powers and functions), Union judiciary (Supreme court), Jurisdiction of the supreme court.

UNIT - IV STATE GOVERNMENT

State Government: State Government, State legislature (Legislative Assembly/ Vidhan Sabha, Legislative council/ Vidhan parishad), powers and functions of the state legislature, State executive, Governor of the state (with powers and functions), The chief Minister of the state (with powers and functions), State Judiciary (High courts)

UNIT - V	ELECTION COMMISSION	
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		
<ol style="list-style-type: none"> 1. M.V.Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice-Hall of India Pvt. Ltd. New Delhi 2. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Rights, Challenges to Civil Rights Guarantees in India, Oxford University Press, 2012 3. P.M. Bakshi, The constitution of India, Universal Law Publishing Co., 4. The Constitution of India, 1950 (Bare Act), Government Publication. 5. Dr. S.N. Busi, Dr. B.R. Ambedkar framing of Indian Constitution, 1st Edition, 2015. 		
REFERENCE BOOKS		
<ol style="list-style-type: none"> 1. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014. 2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015. 3. Indian constitution at work, NCERT 4. Subash Kashyap, Indian Constitution, National Book Trust 5. J.A. Siwach, Dynamics of Indian Government & Politics 6. D.C. Gupta, Indian Government and Politics 7. H.M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication) 8. J.C. Johari, Indian Government and Politics Hans 9. J. Raj Indian Government and Politics 		
E-RESOURCES		
<ol style="list-style-type: none"> 1. nptel.ac.in/courses/109104074/8 2. nptel.ac.in/courses/109104045/ 3. nptel.ac.in/courses/101104065/ 4. www.hss.iitb.ac.in/en/lecture-details 5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution 		

ACADEMIC REGULATIONS AND COURSE STRUCTURE

CHOICE BASED CREDIT SYSTEM

AR22

**Computer Science & Engineering
(Artificial Intelligence and Machine Learning)**

Bachelor of Technology (B.Tech)

B. Tech. - Regular Four Year Degree Programme

(For batches admitted from the academic year 2022-2023)

&

**(For batches admitted Lateral Entry Scheme from the
academic year 2023-2024)**

MLR Institute of Technology

(Autonomous)

Laxman Reddy Avenue, Dundigal (V), Quthbullapur (M),
Hyderabad – 500043, Telangana State

<https://www.mlrit.ac.in>, Email: director@mlrinstitutions.ac.in

COURSE STRUCTURE

Course Structure

B. TECH – Computer Science and Engineering (AIML)

Regulations: R22

I B.Tech.- I Semester									
Induction program for one weeks									
Code	Course Title	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	-	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	-	4	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	-	-	3	40	60	100
A6ME02	Engineering Drawing	ESC	1	-	3	2.5	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	-	-	3	1.5	40	60	100
A6BS08	Applied Physics Lab	BSC	-	-	3	1.5	40	60	100
A6ME04	Engineering workshop	ESC	-	-	3	1.5	40	60	100
A6AI01	Elements of Artificial Intelligence	ESC	1	-	2	2	50	-	50
TOTAL			11	2	14	20	330	420	750
I B.Tech.- II Semester									
Code	Course Title	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	-	4	40	60	100
A6HS01	English for skill Enhancement	HSMC	3	-	-	3	40	60	100
A6BS09	Engineering Chemistry	BSC	3	1	-	4	40	60	100
A6EE60	Basic Electrical and Electronics Engineering	BSC	3	-	-	3	40	60	100
A6EC03	Electronic Devices and Circuits	ESC	2	-	-	2	40	60	100
A6HS02	English Language and Communication Skills Lab	HSMC	-	-	3	1.5	40	60	100
A6CS04	Python Programming Lab	ESC	-	-	3	1.5	40	60	100
A6HS04	Seminar	HSMC	-	-	2	1	50	-	50
A6BS11	Environmental Science	MC	3	0	0	0	50	-	50
TOTAL			17	2	8	20	380	420	800

II B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6CS08	Discrete Mathematics	BSC	3	-	-	3	40	60	100
A6CS07	Software Engineering	PCC	3	-	-	3	40	60	100
A6CS28	Digital electronics Computer Organization	ESC	3	-	-	3	40	60	100
A6IT02	Object Oriented Programming through JAVA	ESC	3	-	-	3	40	60	100
A6CS05	Data structures	PCC	3	-	-	3	40	60	100
A6CS06	Data Structures Lab	PCC	-	-	3	1.5	40	60	100
A6IT03	Object Oriented Programming through JAVA Lab	ESC	-	-	3	1.5	40	60	100
A6AI04	Skill Development (Android)	PCC	-	-	4	2	-	100	100
Total			15	00	10	20	280	520	800
Mandatory Course (Non-Credit)									
A6HS06	Constitution of India	MC	2	-	-	-	50	-	50

II B.Tech.- II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS03	Computer Oriented Statistical Methods	BSC	3	1	-	4	40	60	100
A6HS08	Business Economics and Financial Analysis	HSC	3	-	-	3	40	60	100
A6AI02	Artificial Intelligence	PCC	2	-	-	2	40	60	100
A6CS09	Database Management Systems	PCC	3	-	-	3	40	60	100
A6CS15	Design and Analysis of Algorithms	PCC	3	-	-	3	40	60	100
A6AI03	Artificial Intelligence Lab	PCC	-	-	3	1.5	40	60	100
A6CS10	Database Management Systems Lab	PCC	-	-	3	1.5	40	60	100
A6AI05	Real-time Research Project / Societal Related Project	PWC	-	-	4	2	50	-	50
Total			14	1	10	20	330	420	750
Mandatory Course (Non-Credit)									
A6HS05	Gender Sensitization	MC	-	-	2	-	50	-	50

III B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6IT11	Automata and Compiler Design	PCC	3	-	-	3	40	60	100
A6AI06	Machine Learning	PCC	3	-	-	4	40	60	100
A6AI07	Web Programming	PCC	3	-	-	3	40	60	100
	Professional Elective-I	PEC	3	-	-	3	40	60	100
A6CS11	Operating Systems	PCC	3	-	-	3	40	60	100
A6AI08	Web Programming Lab	PCC	-	-	3	1.5	40	60	100
A6AI09	Machine Learning Lab	PCC	-	-	3	1.5	40	60	100
A6AI16	Independent Study/Moocs/Certification	PWC	-	-	2	1	-	100	100
Total			15	00	08	20	280	520	800
Mandatory Course (Non-Credit)									
A6HS10	Human Values and Professional Ethics	MC	2	-	-	-	50	-	50
III B.Tech.- II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6CS07	Computer Networks	PCC	3	-	-	3	40	60	100
A6AI14	Natural Language Processing	PCC	3	-	-	3	40	60	100
	Professional Elective-II	PEC	3	-	-	3	40	60	100
	Professional Elective-III	PEC	3	-	-	3	40	60	100
	Open Elective-I	OEC	3	-	-	3	40	60	100
	Professional Elective - II Lab	PEC	-	-	3	1.5	40	60	100
A6AI15	Natural Language Processing Lab	PCC	-	-	3	1.5	40	60	100
A6AI10	Mini Project /Internships	PCC	-	-	4	2	-	100	100
Total			15	00	10	20	280	520	800
Mandatory Course (Non-Credit)									
A6BS11	Environmental Science	MC	3	0	0	0	50	-	50

Note: Environmental Science (A6BS11) will be applicable for Lateral Entry students

IV B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6A117	Deep Learning	PCC	3	-	-	3	40	60	100
A6A118	Knowledge Representation and Reasoning	PCC	3	-	-	3	40	60	100
	Professional Elective-IV	PEC	3	-	-	3	40	60	100
	Professional Elective-V	PEC	3	-	-	3	40	60	100
	Open Elective-II	OEC	3	-	-	3	40	60	100
A6A119	Deep Learning Lab	PCC	-	-	2	1	40	60	100
	Research Project Phase - 1	PCC	-	-	8	4	100	-	100
Total			15	00	10	20	340	360	700

IV B.Tech. - II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6HS15	Organizational Behaviour	HSMC	3	-	-	3	40	60	100
	Professional Elective-VI	PEC	3	-	-	3	40	60	100
	Open Elective - III	OEC	3	-	-	3	40	60	100
	Research Project Phase - 2	PWC	-	-	22	11	40	60	100
Total			09	00	22	20	160	240	400

SEM	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	20	20	20	20	20	20	20	160

*Environmental Studies have to be taken by LE in 2-1

**MC: Satisfactory / Non-Satisfactory

PROFESSIONAL ELECTIVES			
PE - I		PE - II	
A6DS29	Cloud Computing	A6DS02	Big Data Analytics USING R
A6AI11	Data Mining Techniques	A6DS25	OOAD
A6AI12	Image Processing	A6DS23	Internet of things
A6AI13	Software Testing Methodologies	A6IT10	Full stack development
PE - III		PE - IV	
	Scripting Language	A6CY22	Mobile Computing
A6AI19	Pattern Recognition	A6AI20	Expert Systems
A6AI26	Neural Networks	A6AI21	Cognitive Computing
A6IT26	Information Retrieval Systems	A6AI22	Augmented Reality and Virtual Reality
PE - V		PE - VI	
A6AI23	Computer Vision & Robotics automation	A6CY10	Ethical hacking
A6AI24	Game Theory	A6DS22	Business Intelligence & Analysis
A6AI25	Quantum Computing	A6IT33	e-Commerce
A6CY06	Cryptography and Network Security	A6CY25	Block Chain Technologies
PE - II LAB			
A6DS03	Big Data Analytics USING R Lab		
A6DS26	OOAD Lab		
A6DS24	Internet of things Lab		
A6IT11	Full stack development Lab		

COURSE STRUCTURE

Course Structure

B. TECH – Computer Science and Engineering (Cyber Security)

Regulations: R22

I B.Tech.- I Semester

Induction program for one weeks

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	0	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	0	3	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A6ME02	Engineering Drawing	ESC	1	0	3	3	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	0	0	3	2	40	60	100
A6BS08	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A6ME04	Engineering workshop	ESC	0	0	3	1.5	40	60	100
A6HS04	Seminar	HSMC	0	0	2	1	50	-	50
A6CY01	Fundamentals for Cyber Security	ESC	1	0	0	1	50	-	50
TOTAL			11	2	14	20	380	420	800

I B.Tech.- II Semester

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	0	4	40	60	100
A6HS01	English for skill Enhancement	HSMC	3	0	0	3	40	60	100
A6BS09	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A6EE60	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60	100
A6EC03	Electronic Devices and Applications	ESC	2	0	0	2	40	60	100
A6HS02	English Language and Communication Skills Lab.	HSMC	0	0	3	1.5	40	60	100
A6CS04	Python Programming Lab	ESC	0	0	3	1.5	40	60	100
A6CY02	Essentials of Ethical Hacking	ESC	0	0	2	1	50	-	50
A6BS11	Environmental Science	MC	3	0	0	0	50	-	50
TOTAL			17	2	8	20	380	420	800

II B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6CS08	Discrete Mathematics	BSC	3	-	-	3	40	60	100
A6CS18	Computer Network	PCC	3	-	-	3	40	60	100
A6CS15	Design and Analysis of Algorithms	PCC	3	-	-	3	40	60	100
A6CS09	Database Management Systems	PCC	3	-	-	3	40	60	100
A6IT02	Object Oriented Programming Through Java	PCC	3	-	-	3	40	60	100
A6CS10	Database Management Systems Lab	PCC	-	-	3	1.5	40	60	100
A6IT03	Object Oriented Programming Through Java Lab	PCC	-	-	3	1.5	40	60	100
A6CY05	Skill Development	PCC	-	-	4	2	100	-	100
Total			15	01	10	20	380	420	800
Mandatory Course									
A6HS06	Constitution of India	MC	2	-	-	-	50	-	50

II B.Tech.- II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS03	Computer Oriented Statistical Methods	BSC	3	1	-	4	40	60	100
A6HS08	Business Economics and Financial Analysis	HSC	3	-	-	3	40	60	100
A6CS05	Data Structures	PCC	3	-	-	3	40	60	100
A6CY03	Operating Systems and Security Distribution	PCC	2	-	-	2	40	60	100
A6CS28	Digital Electronics And Computer Organization	ESC	3	-	-	3	40	60	100
A6CS06	Data Structures Lab	PCC	-	-	3	1.5	40	60	100
A6CY04	Operating Systems and Security Distribution Lab	PCC	-	-	3	1.5	40	60	100
A6CY06	Mini Project/Internship (Research/Societal)	PWC	-	-	2	2	40	60	100
Total			14	1	8	20	320	480	800
Mandatory Course									
A6HS05	Gender Sensitization	MC	2	-	-	0	50	-	50

III B.Tech.- I SEMESTER									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6IT11	Automata and Compiler Design	PCC	3	-	-	3	40	60	100
A6AI07	Web Programming	PCC	3	-	-	3	40	60	100
A6CY06	Network Security & Cryptography	PCC	3	-	-	3	40	60	100
	Professional Elective – I	PEC	3	-	-	3	40	60	100
A6CY07	Security Information and Event Management	PCC	3	-	-	3	40	60	100
A6AI08	Web Programming Lab	PCC	-	-	3	1.5	40	60	100
A6CY08	Network Security & Cryptography Lab	PCC	-	-	3	1.5	40	60	100
A6CY09	Skill Development Course (Node JS/React JS/Django)	PCC	-	-	4	2	40	60	100
Total			15	-	10	20	320	480	800
Mandatory Course									
A6HS10	Human Values & Professional Ethics	MC	2	-	-	0	50	-	50

III B.Tech.- II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6CY12	Web Security	PCC	3	1	-	4	40	60	100
A6CY13	Vulnerability Assessment & Penetration Testing	PCC	3	-	-	3	40	60	100
	Professional Elective – II	PEC	3	-	-	3	40	60	100
	Professional Elective – III	PEC	3	-	-	3	40	60	100
	Open Elective-I	OEC	3	-	-	3	40	60	100
	Professional Elective -II Lab	PEC	-	-	3	1.5	40	60	100
A6CY14	Vulnerability Assessment & Penetration Testing lab	PCC	-	-	3	1.5	40	60	100
A6BS11	Environmental Science (only for Lateral Entry Students)	ES	2	-	-	-	50	-	50
TOTAL			15	1	6	20	280	520	800

IV B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6CY24	Quantum Cryptography	PCC	3	-	-	3	40	60	100
A6CY25	Block Chain Technologies	PCC	3	-	-	3	40	60	100
	Professional Elective – IV	PEC	3	-	-	3	40	60	100
	Professional Elective – V	PEC	3	-	-	3	40	60	100
	Open Elective-II	OEC	3	-	-	3	40	60	100
A6CY26	Block Chain Technologies Lab	PCC	-	-	2	1	40	60	100
A6CY27	Research Project Phase – 1	PWC	-	-	8	4	100	-	100
TOTAL			15	-	10	20	280	420	700

IV B.Tech. - II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6HS15	Operational Behaviour	PCC	3	-	-	3	40	60	100
	Professional Elective – VI	PEC	3	-	-	3	40	60	100
	Open Elective-III	OEC	3	-	-	3	40	60	100
A6CY28	Research Project Phase – 2 +Seminar	PWC	-	-	22	9+2	40	60	100
TOTAL			9	-	22	20	160	240	400

PROFESSIONAL ELECTIVES			
PE - I		PE - II	
A6CS07	Software Engineering	A6CY16	Crime Investigation & Digital Forensic
A6CY10	Ethical Hacking	A6AI06	Machine Learning
A6CY11	Ad-hoc & Sensor Networks	A6CY18	Mobile Application Development & Security
A6DS29	Cloud Computing	A6CY20	IoT Security
PE - III		PE - IV	
A6CY22	Mobile Computing	A6AI14	NLP
A6AI02	Artificial Intelligence	A6CY30	Web & Database Security
	DevOps	A6CY31	Computer Security & Audit Assurance
A6CY23	Cyber Laws	A6CY32	Social Media Security
PE - V		PE - VI	
A6AI25	Quantum Computing	A6CY36	IoT Cloud Processing and Analytics
A6CY33	Data Analytics for Fraud Detection	A6IT33	Commerce
A6CY34	Security Incident & Response Management (SOC)	A6CY37	Digital Watermarking and Steganography
A6CY35	Authentication Techniques	A6CY38	Data Privacy
PE - II LAB			
A6CY17	Crime Investigation & Digital Forensic Lab		
A6AI09	Machine Learning Lab		
A6CY19	Mobile Application Development & Security Lab		
A6CY21	IoT Security Lab		

COURSE STRUCTURE
B. TECH – Electronics and Communication Engineering
REGULATIONS: R22

I YEAR I SEMESTER									
Induction program for one weeks									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	0	4	40	60	100
A6HS01	English for skill Enhancement	HSC	3	0	0	3	40	60	100
A6BS09	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A6EE62	Basic Electrical Engineering	ESC	3	0	0	3	40	60	100
A6HS02	English Language and Communication skills Lab	HSC	0	0	3	1.5	40	60	100
A6BS14	Engineering Chemistry Lab	BSC	0	0	3	1.5	40	60	100
A6EE63	Basic Electrical Engineering Lab	ESC	0	0	3	1.5	40	60	100
A6ME04	Engineering Work Shop	ESC	0	0	3	1.5	40	60	100
TOTAL			12	2	12	20	320	480	800
A6BS11	Environmental Science	MC	3	0	0	0	50	--	50
I YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	0	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	0	4	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A6ME02	Engineering Drawing	ESC	1	0	3	2.5	40	60	100
A6EC01	Electronic Devices and Circuits	ESC	2	0	0	2	40	60	100
A6BS08	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	0	0	3	1.5	40	60	100
A6EC02	Electronic Devices and Circuits Lab	ESC	0	0	3	1.5	40	60	100
TOTAL			12	2	12	20	320	480	800

II YEAR I SEMESTER									
Course Code	Course Title	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6EC05	Analog Circuits	PCC	3	0	0	3	40	60	100
A6CS05	Data Structures	PCC	3	0	0	3	40	60	100
A6EC06	Signals and Systems	PCC	3	1	0	4	40	60	100
A6EC07	Electronic Measurements and Instrumentation	ESC	3	0	0	3	40	60	100
A6EC08	Probability Theory and Stochastic Processes	ESC	3	1	0	4	40	60	100
A6EC09	Analog Circuits Lab	PCC	0	0	2	1	40	60	100
A6CS06	Data Structures Lab	ESC	0	0	2	1	40	60	100
A6EC10	Basic Simulation Lab	ESC	0	0	2	1	40	60	100
TOTAL			15	2	6	20	320	480	800
Mandatory Course (Non-Credit)									
A6HS06	Constitution of India	MC	2	0	0	-	50	--	50
II YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6EC11	Linear and Digital Integrated Circuit Applications	PCC	3	0	0	3	40	60	100
A6EC12	Digital System Design	PCC	3	0	0	3	40	60	100
A6EC13	Analog and Digital Communication	PCC	3	0	0	3	40	60	100
A6BS04	Vector Calculus And Complex Analysis	BSC	3	0	0	3	40	60	100
A6EC14	Electromagnetic and Transmission Lines	PCC	3	0	0	3	40	60	100
A6EC15	Analog & Digital IC Applications Lab	PCC	0	0	2	1	40	60	100
A6EC16	Digital System Design Lab	PCC	0	0	2	1	40	60	100
A6EC17	Analog and Digital Communications Lab	PCC	0	0	3	1	40	60	100
A6EC18	Real Time Projects/Field based Projects	PCC	0	0	4	2	40	60	100
TOTAL			15	0	11	20	360	540	900
Mandatory Course (Non-Credit)									
A6HS05	Gender sensitization	MC	0	0	2	-	50	--	50

III YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6EC19	IoT Architecture and Protocol	PCC	3	0	0	3	40	60	100
A6EC20	Control Systems	PCC	3	0	0	3	40	60	100
A6EC21	Microprocessors and Microcontrollers	PCC	3	0	0	3	40	60	100
	Professional Elective – 1	PEC	3	0	0	3	40	60	100
	Open Elective-1	OEC	3	0	0	3	40	60	100
A6EC22	Microprocessors and Microcontrollers Lab	PCC	0	0	2	1	40	60	100
A6EC23	IoT Architecture Lab	PCC	0	0	2	1	40	60	100
A6IT41	Object Oriented Programming Lab	PCC	0	0	2	1	40	60	100
A6EC24	Mini Projects/Internships*	PWC	0	0	4	2	40	60	100
TOTAL			15	0	10	20	320	480	800
Mandatory Course (Non-Credit)									
A6HS10	Human Values and Professional Ethics	MC	2	0	0	-	50	--	50
III YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6EC25	Digital Signal Processing	PCC	3	0	0	4	40	60	100
A6EC26	Antennas and Wave propagation	PCC	3	0	0	3	40	60	100
	Professional Elective – 2	PEC	3	0	0	3	40	60	100
	Professional Elective – 3	PEC	3	0	0	3	40	60	100
	Open Elective-2	OEC	3	0	0	3	40	60	100
A6EC27	Digital Signal Processing Lab	PCC	0	0	2	1	40	60	100
A6EC28	Antennas and Wave propagation Lab	PCC	0	0	2	1	40	60	100
	Advanced English Communication Skills Lab	HSMC	0	0	2	1	40	60	100
A6EC29	Independent Study/ MOOC'S	PWC	-	-	-	1	--	100	100
TOTAL			15	0	6	20	320	580	900
Mandatory Course (Non-Credit)									
A6BS11	Environmental Science*	MC	3	0	0	0	50	--	50

*Applicable to lateral entry students

IV YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6EC30	VLSI Design	PCC	3	0	0	3	40	60	100
A6EC31	Embedded System & RTOS	PCC	3	0	0	3	40	60	100
A6EC32	Microwave Engineering	PCC	3	0	0	3	40	60	100
A6EC32	Computer Networks	PCC	3	0	0	3	40	60	100
	Professional Elective -4	PEC	3	0	0	3	40	60	100
A6EC33	VLSI Design Lab	PCC	0	0	2	1	40	60	100
A6EC34	Embedded & RTOS Lab	PCC	0	0	2	1	40	60	100
A6EC35	Research Project Stage-I	PWC	0	0	6	3	100	--	100
TOTAL			15	0	10	20	380	420	800
IV YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
	Professional Elective -5	PEC	3	0	0	3	40	60	100
	Professional Elective -6	PEC	3	0	0	3	40	60	100
	Open Elective-3	OEC	3	0	0	3	40	60	100
A6EC36	Research Project Stage-II	PWC	0	0	22	11	50	150	200
TOTAL			9	0	22	20	170	330	500

PROFESSIONAL ELECTIVES			
PE-I		PE-II	
A6EC37	Fiber Optic Communication	A6EC40	Introduction to Artificial Intelligence
A6EC38	Sensors and Actuators	A6EC41	Introduction to MEMS
A6EC39	ASIC Design	A6EC42	Digital Design through Verilog
PE-III		PE-IV	
A6EC43	Digital Image Processing	A6EC46	Satellite Communication
A6EC44	Internet of Things & Applications	A6EC47	Machine Learning Techniques
A6EC45	Physical Design Basics	A6EC48	Design of Testability
PE- V		PE-VI	
A6EC49	Cellular Mobile Communications	A6EC52	Radar Systems
A6EC50	Artificial Neural Networks	A6EC53	Deep Learning Algorithms
A6EC51	CMOS Analog Design	A6EC54	Low Power VLSI

OPEN ELECTIVE COURSES

OPEN ELECTIVE COURSE-I			
S. No.	Course Code	Course Name	Offering Department
1.	A6EC55	Microprocessors and Interfacing	Electronics & Communication Engineering
2.	A6EC56	Principles of Communications	
OPEN ELECTIVE COURSE-II			
3.	A6EC57	Microcontrollers and Applications	Electronics & Communication Engineering
4.	A6EC58	Fundamentals of Image processing	
OPEN ELECTIVE COURSE-III			
5.	A6EC59	Introduction to Sensors and Actuators	Electronics & Communication Engineering
6.	A6EC60	Introduction to Computer Vision	
OPEN ELECTIVE COURSE-IV			
7.	A6EC61	Introduction to Mobile Communications	Electronics & Communication Engineering
8.	A6EC62	Basics of Embedded System Design	

Note:

BSC- Basic Science Courses

ESC-Engineering Science Courses

HSMC-Humanities and Social Science including Management Courses

PCC- Professional Core Courses

PEC- Program Elective Courses

OEC- Open Elective Courses

PWC- Project work Related Courses

COURSE STRUCTURE
B. TECH – Electrical and Electronics Engineering

REGULATIONS: AR22

I YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	0	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	0	4	40	60	100
A6BS09	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A6ME01	Engineering Graphics	ESC	1	0	4	3	40	60	100
A6BS08	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A6BS10	Engineering Chemistry Lab	ESC	0	0	3	1.5	40	60	100
A6ME03	Engineering workshop Practices	ESC	0	1	2	2	40	60	100
A6BS11	Environmental Science	MC	3	0	0	0	50		50
TOTAL			13	4	12	20	330	420	750
I YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	0	4	40	60	100
A6HS01	English for Skill Enhancement	HSMC	3	0	0	3	40	60	100
A6EE01	Electrical Circuits-1	ESC	3	1	0	4	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A6HS02	English Language and Communication Skills Lab	HSMC	0	0	3	1.5	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	0	0	3	1.5	40	60	100
A6EE02	Electrical Circuits Lab	ESC	0	0	2	1	40	60	100
A6EE03	Applied Python Programming Laboratory	ESC	0	0	2	1	40	60	100
A6HS04	Seminar	HSMC	0	0	2	1	50		50
TOTAL			12	2	12	20	370	480	850

II B.Tech I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6EE04	Electrical Circuits – II	ESC	3	-	-	3	40	60	100
A6EC01	Electronic Devices and circuits	ESC	3	-	-	3	40	60	100
A6EE05	Electrical Machines – I	PCC	3	1	-	4	40	60	100
A6EE06	Electromagnetic Fields	PCC	3	-	-	3	40	60	100
A6BS06	Vector calculus and Complex Analysis	BSC	3	1	-	4	40	60	100
A6EC02	Electronic Devices and circuits Lab	ESC	-	-	2	1	40	60	100
A6EE07	Electrical Machines –I Lab	PCC	-	-	2	1	40	60	100
A6EE08	Electrical Simulation tools Laboratory	PCC	-	-	2	1	40	60	100
Total			15	2	6	20	320	480	800
Mandatory Course (Non-Credit)									
A6HS06	Constitution of India	HSMC	2	-	-	-	50	-	50

II B.Tech IISemester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6EC12	Digital System Design	PCC	3	-	-	3	40	60	100
A6EE09	Electrical Machines – II	PCC	3	-	-	3	40	60	100
A6EE10	Power Systems – I	PCC	3	-	-	3	40	60	100
A6EC06	Signals and systems	PCC	3	-	-	3	40	60	100
A6EE11	Electrical Measurements and Instrumentation	PCC	3	-	-	3	40	60	100
A6EC16	Digital System Design Lab	PCC	-	-	2	1	40	60	100
A6EE12	Electrical Machines - II Lab	PCC	-	-	2	1	40	60	100
A6EE13	Electrical Measurements and Instrumentation Lab	PCC	-	-	2	1	40	60	100
A6EE14	Real time/ field project	PWC			4	2	50		50
Total			15	-	10	20	370	480	850
Mandatory Course (Non-Credit)									
A6HS05	Gender sensitization	HSMC	-	-	2	-	50	-	50

III B.Tech I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6EE15	Power Electronics	PCC	3	1	-	4	40	60	100
A6EE16	Power Systems – II	PCC	3	-	-	3	40	60	100
A6EE17	Linear Control Systems	PCC	3	-	-	3	40	60	100
	Professional Elective –1	PEC	3	-	-	3	40	60	100
	Business Economics and Financial Analysis	HSMC	3	-	-	3	40	60	100
A6EE18	Control Systems Lab	PCC	-	-	2	1	40	60	100
A6EE19	Power Electronics Lab	PCC	-	-	2	1	40	60	100
A6HS03	Advanced English Communication skills Lab	HSMC	-	-	2	1	40	60	100
A6EE20	Independent study	PWC	-	-	-	1		100	100
Total			15	1	6	20	320	580	900
Mandatory Course (Non-Credit)									
A6HS10	Human values and Professional Ethics		2	-	-	-	50	-	50
III B.Tech II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6EE21	Switch gear and protection	PCC	3	-	-	3	40	60	100
A6EC21	Microprocessors and Microcontrollers	PCC	3	-	-	3	40	60	100
A6EE22	Electric Drives	PCC	3	-	-	3	40	60	100
	Professional Elective –2	PEC	3	-	-	3	40	60	100
	Open Elective – 1	OEC	3	-	-	3	40	60	100
A6EE23	Electric Drives Lab	PCC	-	-	2	1	40	60	100
A6EC22	Microprocessors and Microcontrollers Lab	PCC	-	-	2	1	40	60	100
A6EE24	Power Systems and Protection Lab	PCC	-		2	1	40	60	100
A6EE25	Mini project/Internship	PWC	-	-	4	2		100	100
Total			15	-	10	20	320	580	900
Mandatory Course (Non-Credit)									
A6BS11	Environmental Science	HSMC	2	-	-	-	50	-	50

IV B.Tech I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6EE26	Power System Operation and control	PCC	3	1	-	4	40	60	100
A6EE27	Utilization of Electrical Energy	PCC	3	-	-	3	40	60	100
	Professional Elective-3	PEC	3	-	-	3	40	60	100
	Professional Elective-4	PEC	3	-	-	3	40	60	100
	Open Elective – 2	OEC	3	-	-	3	40	60	100
A6EE28	Power Systems Simulation Lab	PCC	-	-	2	1	40	60	100
A6EE29	Research Project Phase-I	PWC	!	!	6	3	100		100
Total			15	1	8	20	340	360	700

IV B.Tech II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
	Professional Elective -5	PEC	3	-	-	3	40	60	100
	Professional Elective -6	PEC	3	-	-	3	40	60	100
	Open Elective-3	OEC	3	-	-	3	40	60	100
A6EE30	Research Project Phase-II	PWC	!	!	22	9+2	40	60	100
Total			9	-	22	20	160	240	400

PROFESSIONAL ELECTIVES			
PROFESSIONAL ELECTIVE-I		PROFESSIONAL ELECTIVE-II	
A6EE31	Wind and Solar Energy Systems	A6EE35	Linear and Digital IC Applications
A6EE32	AI Techniques in Electrical Engineering	A6EE36	Industrial Automation
A6EE33	Special Electrical Machines	A6EE37	Solar Power Batteries
A6EE34	Digital Signal Processing	A6EE38	Electrical Energy Conservation and Auditing
PROFESSIONAL ELECTIVE-III		PROFESSIONAL ELECTIVE-IV	
A6EE39	Modelling and Analysis of Electrical Machines	A6EE43	HVDC Transmission Systems
A6EE40	Machine Learning Applications to Electrical Engineering	A6EE44	Power System Dynamics and Control
A6EE41	Electrical Distribution Systems	A6EE45	Soft Computing Techniques
A6EE42	Flexible Alternating Current Transmission Systems	A6EE46	High Voltage Engineering
PROFESSIONAL ELECTIVE-V		PROFESSIONAL ELECTIVE-VI	
A6EE47	Power System Reliability	A6EE51	Reactive Power Control & Management
A6EE48	Smart Grid Technologies	A6EE52	Advanced Control Systems
A6EE49	Advanced Electric Drives	A6EE53	Power Quality
A6EE50	Electric Hybrid Vehicles	A6EE54	Power Electronic Applications to Renewable Energy Systems

OPEN ELECTIVE COURSE-I			
S. No.	Course Code	Course Name	Offering Department
1	A6EE55	Electrical Wiring and Safety Measures	Electrical & Electronics Engineering
2	A6EE56	Electrical Materials	
OPEN ELECTIVE COURSE-II			
S. No.	Course Code	Course Name	Offering Department

1	A6EE57	Neural Networks and Fuzzy Logic	Electrical &Electronics Engineering
2	A6EE58	Energy Storage Systems	
OPEN ELECTIVE COURSE-III			
S. No.	Course Code	Course Name	Offering Department
1	A6EE59	Solar Energy and Applications	Electrical &Electronics Engineering
2	A6EE65	Instrumentation and Control	

MLR INSTITUTE OF TECHNOLOGY
INFORMATION TECHNOLOGY
COURSE STRUCTURE – R22

I YEAR I SEMESTER									
Induction program for one weeks									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	0	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	0	4	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A6ME02	Engineering Drawing	ESC	1	0	3	2.5	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	0	0	3	1.5	40	60	100
A6BS08	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A6ME04	Engineering workshop	ESC	0	0	3	1.5	40	60	100
A6HS04	Seminar	HSMC	0	0	2	1	50	-	100
A6IT01	Basics of Information Technology	ESC	0	0	2	1	50	-	100
TOTAL			11	2	14	20	380	420	800
I YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	0	4	40	60	100
A6HS01	English for skill Enhancement	HSMC	3	0	0	3	40	60	100
A6BS09	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A6EE60	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60	100
A6EC03	Electronic Devices and Applications	ESC	2	0	0	2	40	60	100
A6HS02	English Language and Communication Skills Lab.	HSMC	0	0	3	1.5	40	60	100
A6CS04	Python Programming Lab	ESC	0	0	3	1.5	40	60	100
A6EC04	Introduction to Internet of Things	ESC	0	0	2	1	40	60	100
A6BS11	Environmental Science	MC	3	0	0	0	50	-	50
TOTAL			17	2	8	20	370	480	850

II YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6BS03	Computer Oriented Statistical Methods	BSC	3	1	0	4	40	60	100
A6CS08	Discrete Mathematics	BSC	3	0	0	3	40	60	100
A6IT02	Object Oriented Programming through Java	PCC	3	0	0	3	40	60	100
A6CS09	Database Management Systems	PCC	3	0	0	3	40	60	100
A6HS08	Business Economics and Financial Analysis	HSMC	3	0	0	3	40	60	100
A6IT03	Object Oriented Programming through Java Lab	PCC	0	0	3	1.5	40	60	100
A6CS10	Database Management Systems Lab	PCC	0	0	3	1.5	40	60	100
A6IT04	Skill Development Course (HTML, CSS, JavaScript, Bootstrap)	PCC	0	0	2	1	-	100	100
TOTAL			15	1	8	20	280	520	800
Mandatory Course									
A6HS05	Gender Sensitization	MC	0	0	2	0	50	-	50
II YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6CS28	Digital Electronics and Computer Organization	ESC	3	0	0	3	40	60	100
A6CS11	Operating Systems	PCC	3	0	0	3	40	60	100
A6IT05	Software Engineering and Design	PCC	3	0	0	3	40	60	100
A6CS15	Design and Analysis of Algorithms	PCC	3	0	0	3	40	60	100
A6IT06	Data Structures through Java	PCC	3	0	0	3	40	60	100
A6IT07	Data Structures through Java Lab	PCC	0	0	3	1.5	40	60	100
A6IT08	Software Engineering and Design Lab	PCC	0	0	3	1.5	40	60	100
A6IT09	Real Time Research Project/Societal related project	PWC	0	0	4	2	50	-	50
TOTAL			15	0	10	20	330	420	750
Mandatory Course									
A6HS06	Constitution of India	MC	2	0	0	0	50	-	50

III YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6IT10	Full Stack Development	PCC	3	0	0	3	40	60	100
A6IT11	Automata and Compiler Design	PCC	3	0	0	3	40	60	100
A6IT12	Data Communication & Computer Networks	PCC	3	0	0	3	40	60	100
	Professional Elective – I	PEC	3	0	0	3	40	60	100
A6IT13	Cloud & DevOps	PCC	3	0	0	3	40	60	100
A6IT14	Full Stack Development Lab	PCC	0	0	3	1.5	40	60	100
A6IT15	Linux Programming Lab	PCC	0	0	2	1	40	60	100
A6IT16	Cloud & DevOps Lab	PCC	0	0	3	1.5	40	60	100
A6IT17	MOOCS/Independent Study	PCC	0	0	2	1	-	100	100
TOTAL			15	0	10	20	320	580	900
Mandatory Course									
A6HS10	Human Values and Professional Ethics	MC	2	0	0	0	50	-	50
III YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6AI06	Machine Learning	PCC	3	0	0	3	40	60	100
A6IT18	Testing Automation	PCC	3	0	0	3	40	60	100
	Professional Elective – II	PEC	3	0	0	3	40	60	100
	Professional Elective – III	PEC	3	0	0	3	40	60	100
	Open Elective-I	OEC	3	0	0	3	40	60	100
A6AI09	Machine Learning Lab	PCC	0	0	3	1.5	40	60	100
A6IT19	Testing Automation Lab	PCC	0	0	3	1.5	40	60	100
A6IT20	Mini Project	PWC	0	0	4	2	-	100	100
TOTAL			15	0	10	20	280	520	800
Mandatory Course									
A6BS11	Environmental Sciences (only for LE s)	MC	2	0	0	0	50	-	50

IV YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6DS06	Big Data Technologies	PCC	3	0	0	3	40	60	100
A6CS36	Cyber Security and Cyber Laws	PCC	3	0	0	3	40	60	100
	Professional Elective – IV	PEC	3	0	0	3	40	60	100
	Professional Elective – V	PEC	3	0	0	3	40	60	100
	Open Elective-II	OEC	3	0	0	3	40	60	100
A6DS07	Big Data Technologies Lab	PCC	0	0	2	1	40	60	100
A6IT21	Research Project Phase – 1	PWC	0	0	8	4	100	-	100
TOTAL			15	0	10	20	340	360	700
IV YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6HS15	Organizational Behavior	HSMC	3	0	0	3	40	60	100
	Professional Elective – VI	PEC	3	0	0	3	40	60	100
	Open Elective-III	OEC	3	0	0	3	40	60	100
A6IT22	Research Project Phase – 2	PWC	0	0	22	11	40	60	100
TOTAL			9	0	22	20	160	240	400

PROFESSIONAL ELECTIVES

PROFESSIONAL ELECTIVE – I			PROFESSIONAL ELECTIVE - II		
S. No	Code	Subject	S. No	Code	Subject
1	A6AI11	Data Mining Techniques	1	A6AI02	Artificial Intelligence
2	A6IT23	Introduction to Data Science	2	A6IT26	Information Retrieval Systems
3	A6IT24	Information Security	3	A6IT27	Network Security
4	A6IT25	Mobile Application Development	4	A6IT28	Adhoc & Sensor Networks
PROFESSIONAL ELECTIVE – III			PROFESSIONAL ELECTIVE - IV		
S. No	Code	Subject	S. No	Code	Subject
1	A6IT29	Soft Computing	1	A6AI19	Pattern Recognition
2	A6DS13	Data Wrangling	2	A6DS21	Data Handling and Visualization
3	A6CY25	Blockchain Technology	3	A6IT30	Security Testing
4	A6AI14	Natural Language Processing	4	A6IT31	High Performance Computing
PROFESSIONAL ELECTIVE – V			PROFESSIONAL ELECTIVE - VI		
S. No	Code	Subject	S. No	Code	Subject
1	A6AI17	Deep Learning	1	A6IT33	E-Commerce
2	A6DS14	Predictive Analytics	2	A6CS22	Distributed Computing
3	A6IT32	Software Project Management	3	A6IT34	Network Administration
4	A6CY17	Crime Investigation & Digital Forensics	4	A6AI12	Image Processing

OPEN ELECTIVES

OPEN ELECTIVE – I			
S. No.	Course Code	Course Name	Offering Department
1	A6AE19	Fundamentals of Avionics	Aeronautical Engineering
2	A6AE20	Introduction to Aerospace Technology	
3	A6CS48	Software Project Management Fundamentals	Computer Science and Engineering
4	A6CS49	Data Analytics	
5			Electronics & Communication Engineering
6			
7	A6EE54	Electrical Wiring and Safety Measures	Electrical & Electronics Engineering
8	A6EE55	Electrical Materials	
9	A6IT35	Fundamentals of Data Structures	Information Technology
10	A6IT36	Object Oriented Programming	
11			Mechanical Engineering
12			
13			HSM
14			

OPEN ELECTIVE – II			
S. No.	Course Code	Course Name	Offering Department
1	A6AE25	Introduction to Jets and Rockets	Aeronautical Engineering
2	A6AE26	Non-Destructive Testing Methods	
3	A6CS09	Database Management System	Computer Science and Engineering
4	A6CS50	Data Visualization Techniques	
5			Electronics & Communication Engineering
6			
7	A6EE56	Neural Networks and Fuzzy Logic	Electrical & Electronics Engineering
8	A6EE57	Energy Storage Systems	
9	A6IT37	Introduction to Cloud computing	Information Technology
10	A6IT38	Human Computer Interaction	
11			Mechanical Engineering
12			
13			HSM

OPEN ELECTIVE - III			
S. No.	Course Code	Course Name	Offering Department
1	A6AE40	Introduction to Aircraft Industry	Aeronautical Engineering
2	A6AE41	Unmanned Aerial Vehicles	
3	A6CS51	Artificial Intelligence and Applications	Computer Science and Engineering
4	A6CS36	Cyber Security & Cyber laws	
5			Electronics & Communication Engineering
6			
7	A6EE58	Solar Energy and Applications	Electrical & Electronics Engineering
8	A6EE59	Instrumentation and Control	
9	A6IT39	Introduction to Computer Networks	Information Technology
10	A6IT40	Software Testing Fundamentals	
11			Mechanical Engineering
12			
13			HSM

Course Structure & Detailed Syllabus

CHOICE BASED CREDIT SYSTEM

R22

MECHANICAL ENGINEERING

Bachelor of Technology (B.Tech.)

B. Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2022 - 2023)
&
B. Tech. - Lateral Entry Scheme
(For batches admitted from the academic year 2023 - 2024)



MLR Institute of Technology

(Autonomous)

Laxman Reddy Avenue, Dundigal

Hyderabad – 500043, Telangana State

www.mlrinstitutions.ac.in, Email: director@mlrinstitutions.ac.in

COURSE STRUCTURE

DEPARTMENT OF MECHANICAL ENGINEERING
R22 COURSE STRUCTURE

I B.Tech.- I SEMESTER									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	0	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	0	4	40	60	100
A6BS09	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A6ME01	Engineering Graphics	ESC	1	0	4	3	40	60	100
A6BS08	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A6BS10	Engineering Chemistry Lab	BSC	0	0	3	1.5	40	60	100
A6ME03	Engineering Workshop Practices	ESC	0	1	2	2	40	60	100
A6BS11	Environmental Science	MC	3	0	0	0	50	-	50
TOTAL			13	4	12	20	320	480	750

I B.Tech.- II SEMESTER									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	0	4	40	60	100
A6HS01	English for Skill Enhancement	HSMC	3	0	0	3	40	60	100
A6ME05	Engineering Mechanics	ESC	3	1	0	4	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A6ME06	Elements of Mechanical Engineering Design	ESC	1	0	2	2	50	-	50
A6HS02	English Language and Communication Skills Lab	HSMC	0	0	3	1.5	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	0	0	3	1.5	40	60	100
A6HS04	Seminar	HSMC	0	0	2	1	50	-	50
TOTAL			13	2	10	20	340	360	700

II B.Tech.- I SEMESTER									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS05	Probability, Statistics and Complex Analysis	BSC	3	1	0	4	40	60	100
A6ME09	Strength of Materials	PCC	3	0	0	3	40	60	100
A6ME10	Material Science and Metallurgy	PCC	3	0	0	3	40	60	100
A6ME12	Manufacturing Processes	PCC	3	0	0	3	40	60	100
A6ME14	Thermodynamics	PCC	3	1	0	4	40	60	100
A6ME13	Manufacturing Processes Lab	PCC	0	0	2	1	40	60	100
A6ME11	Strength of Materials and Material Science and Metallurgy lab	PCC	0	0	2	1	40	60	100
A6ME15	Python Lab for Mechanical Applications	ESC	0	0	2	1	40	60	100
A6HS06	Constitution of India	MC	2	0	0	0	50	-	50
TOTAL			7	2	6	20	370	480	850

II B.Tech.- II SEMESTER									
Code	Course	Course Area	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6EE60	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60	100
A6ME16	Fluid Mechanics and Hydraulic Machines	PCC	3	0	0	3	40	60	100
A6ME18	Thermal Engineering - I	PCC	3	0	0	3	40	60	100
A6ME19	Theory of Machines - I	PCC	3	0	0	3	40	60	100
A6ME20	Design of Machine Elements	PCC	3	0	0	3	40	60	100
A6EE61	Basic Electrical and Electronics Engineering Lab	ESC	0	0	2	1	40	60	100
A6ME17	Fluid Mechanics and Hydraulic Machines Lab	PCC	0	0	2	1	40	60	100
A6ME21	Computer Aided Machine Drawing Lab	PCC	0	0	2	1	40	60	100
A6ME22	Real Time Project / Field based Project	PWC	0	0	4	2	50	-	50
A6HS05	Gender Sensitization	MC	0	0	2	0	50	-	50
TOTAL			15	0	12	20	420	480	900

III B.Tech.- I SEMESTER									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
	Business Economics and Financial Analysis	HSMC	2	0	0	2	40	60	100
A6ME23	Machine Design	PCC	3	0	0	3	40	60	100
A6ME24	Theory of Machines - II	PCC	3	0	0	3	40	60	100
A6ME25	Engineering Metrology and Machine Tools	PCC	3	0	0	3	40	60	100
A6ME27	Thermal Engineering - II	PCC	3	0	0	3	40	60	100
	PROFESSIONAL ELECTIVE - I	PCC	3	0	0	3	40	60	100
A6ME26	Engineering Metrology and Machine Tools Lab	PCC	0	0	2	1	40	60	100
A6ME28	Thermal Engineering Lab	PCC	0	0	2	1	40	60	100
A6ME30	Independent Study / Moocs	PWC	0	0	2	1	50	-	50
A6HS10	Human Values and Professional Ethics	MC	2	0	0	0	50	-	50
TOTAL			19	0	6	20	420	480	900

III B.Tech.- II SEMESTER									
Code	Course	Course Area	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6ME31	Heat Transfer	PCC	3	0	0	3	40	60	100
A6ME33	CAD/CAM	PCC	3	0	0	3	40	60	100
A6ME35	Mechatronics	PCC	3	0	0	3	40	60	100
	OPEN ELECTIVE-I	PCC	3	0	0	3	40	60	100
	PROFESSIONAL ELECTIVE - II	PCC	3	0	0	3	40	60	100
A6ME32	Heat Transfer Lab	PCC	0	0	2	1	40	60	100
A6ME34	CAD/CAM Lab	PCC	0	0	2	1	40	60	100
A6ME36	Mechatronics (Sensors and IOT) Lab	ESC	0	0	2	1	40	60	100
A6ME40	Industry Oriented Mini Project / Internship	PWC	0	0	4	2	-	100	100
TOTAL			15	0	10	20	320	580	900
Mandatory Course (Non-Credit)									
A6BS11	Environmental Science (LE Students)	MC	2	0	0	0	50	-	50

IV B.Tech.- I SEMESTER									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6ME41	Finite Element Analysis	PCC	3	0	0	3	40	60	100
A6ME43	Instrumentation and Control Systems	PCC	3	0	0	3	40	60	100
	OPEN ELECTIVE-II	HSMC	3	0	0	3	40	60	100
	PROFESSIONAL ELECTIVE - III	PCC	3	0	0	3	40	60	100
	PROFESSIONAL ELECTIVE - IV	PCC	3	0	0	3	40	60	100
A6ME42	Computer Aided Engineering and Production Drawing Lab	PCC	0	0	2	1	40	60	100
A6ME44	Instrumentation and Control Systems Lab	PCC	0	0	2	1	40	60	100
A6ME45	Research Project Phase - I	PWC	0	0	6	3	-	100	100
TOTAL			15	0	10	20	280	520	800

IV B.Tech.- II SEMESTER									
Code	Course	Course Area	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
	OPEN ELECTIVE-III	HSMC	3	0	0	3	40	60	100
	PROFESSIONAL ELECTIVE - V	PCC	3	0	0	3	40	60	100
	PROFESSIONAL ELECTIVE - VI	PCC	3	0	0	3	40	60	100
A6ME50	Research Project Phase - II	PWC	0	0	22	11	40	60	100
TOTAL			9	0	22	20	160	240	400

List of Open Electives from Mechanical Department:

Open Elective (OE – I)

1. Basic Mechanical Engineering
2. Fundamentals of Engineering Materials

Open Elective (OE – II)

1. Fundamentals of Operations Research
2. Industrial Engineering & Management

Open Elective (OE – III)

1. Renewable Energy Sources
2. Elements of Electric and Hybrid vehicles

PROFESSIONAL ELECTIVE COURSES			
PE-I		PE-II	
	Design for Manufacturing and Assembly		Automobile Engineering
	Unconventional Machining Processes		Power Plant Engineering
	Additive Manufacturing		Refrigeration and Air Conditioning
	Production Planning and Control		Computational Fluid Dynamics
PE-III		PE-IV	
	Artificial Intelligence in Mechanical Engineering		Electric and Hybrid Vehicles
	Turbo Machinery		Machine Dynamics & Vibrations
	Composite Materials		Industrial Management
	Non-Conventional Energy Sources		Automation in Manufacturing
PE-V		PE-VI	
	Industry 4.0		Sustainable Engineering
	Nanotechnology		Operations Research
	Industrial Robotics		Total Quality Management
	Industrial Safety Engineering		Product Life Cycle Management

Academic Regulations
Course Structure & Detailed Syllabus

CHOICE BASED CREDIT SYSTEM

R22

COMPUTER SCIENCE

&

INFORMATION TECHNOLOGY

Bachelor of Technology (B.Tech)

For the batches admitted from the A.Y. 2022-23

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COURSE STRUCTURE

MLR INSTITUTE OF TECHNOLOGY
COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
COURSE STRUCTURE – R22

I YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	0	4	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A6HS01	English for skill Enhancement	HSMC	3	0	0	3	40	60	100
A6BS11	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	0	0	3	1.5	40	60	100
A6HS02	English Language and Communication skills Lab	HSMC	0	0	3	1.5	40	60	100
A6EC04	Introduction to Internet of Things	ESC	0	0	2	1	40	60	100
A6HS04	Seminar	HSMC	0	0	2	1	50	0	50
A6IT01	Basics of Information Technology	ESC	1	0	0	1	50	0	50
TOTAL			13	2	10	20	380	420	800
I YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	0	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	0	4	40	60	100
A6EE60	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60	100
A6ME02	Engineering Drawing	ESC	1	0	3	2.5	40	60	100
A6EC03	Electronic Devices and Applications	ESC	2	0	0	2	40	60	100
A6BS08	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A6CS04	Python Programming Lab	ESC	0	0	3	1.5	40	60	100
A6ME04	Engineering Work Shop	ESC	0	0	3	1.5	40	60	100
TOTAL			12	2	12	20	320	480	800
Mandatory Course									
A6BS11	Environmental Science	BSC	2	0	0	0	50	0	50

II YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6BS03	Computer Oriented Statistical Methods	BSC	3	1	0	4	40	60	100
A6CS08	Discrete Mathematics	BSC	3	0	0	3	40	60	100
A6CS05	Data Structures	ESC	3	0	0	3	40	60	100
A6CS09	Database Management Systems	PCC	3	0	0	3	40	60	100
A6HS08	Business Economics and Financial Analysis	HSMC	3	0	0	3	40	60	100
A6CS06	Data Structures Lab	ESC	0	0	3	1.5	40	60	100
A6CS10	Database Management Systems Lab	PCC	0	0	3	1.5	40	60	100
A6IT04	Skill Development Course (HTML,CSS,JAVASCRIPT,BOOTSTRAP)	PCC	0	0	2	1	0	100	100
TOTAL			15	1	8	20	280	520	800
Mandatory Course									
A6HS05	Gender sensitization		2	0	0	0	50	0	50
II YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6CS28	Digital Electronics and Computer Organization	ESC	3	0	0	3	40	60	100
A6CS15	Design and Analysis of Algorithms	PCC	3	0	0	3	40	60	100
A6IT02	Object Oriented Programming through java	PCC	3	0	0	3	40	60	100
A6CS13	Software Engineering	PCC	3	0	0	3	40	60	100
A6CS11	Operating systems	PCC	3	0	0	3	40	60	100
A6IT03	Object Oriented Programming through java Lab	PCC	0	0	3	1.5	40	60	100
A6CS12	Operating systems Lab	PCC	0	0	3	1.5	40	60	100
A6CT01	Real Time Research Project/Societal Related Project	PWC	0	0	4	2	50	0	50
TOTAL			15	0	10	20	330	520	750
Mandatory Course									
A6HS06	Constitution of India		2	0	0	0	50	0	50

III YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6IT10	Full Stack Development	PCC	3	1	0	4	40	60	100
A6IT11	Automata and Compiler Design	PCC	3	0	0	3	40	60	100
A6IT13	Cloud & DevOps	PCC	3	0	0	3	40	60	100
A6IT12	Data Communication & Computer Networks	PCC	3	0	0	3	40	60	100
PEC	Professional Elective– I	PEC	3	0	0	3	40	60	100
A6IT14	Full Stack Development Lab	PCC	0	0	3	1.5	40	60	100
A6IT16	Cloud & DevOps Lab	PCC	0	0	3	1.5	40	60	100
A6CT02	Moocs/Independent Study	PWC	0	0	0	1	0	100	100
TOTAL			15	1	6	20	280	620	800
Mandatory Course									
A6HS10	Human Values and Professional Ethics		2	0	0	0	50	0	50
III YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6AI06	Machine Learning	PCC	3	0	0	3	40	60	100
A6DS06	Big Data Technologies	PCC	3	0	0	3	40	60	100
PEC	Professional Elective– II	PEC	3	0	0	3	40	60	100
PEC	Professional Elective –III	PEC	3	0	0	3	40	60	100
OEC	Open Elective-I	OEC	3	0	0	3	40	60	100
A6AI09	Machine Learning Lab	PCC	0	0	3	1.5	40	60	100
A6DS07	Big Data Technologies Lab	PCC	0	0	3	1.5	40	60	100
A6CT03	Industrial Oriented Mini Project	PWC	0	0	4	2	0	100	100
A6BS11	Environmental Science		2	0	0	0	50	0	50
TOTAL			17	0	10	20	330	620	850

Note : Environmental Science in III-II should be registered by Lateral Entry students only

IV YEAR I SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6CY06	Cryptography and Network Security	PCC	3	0	0	3	40	60	100
A6IT32	Software Project Management	PCC	3	0	0	3	40	60	100
PEC	Professional Elective -IV	PEC	3	0	0	3	40	60	100
PEC	Professional Elective-V	PEC	3	0	0	3	40	60	100
OEC	Open Elective-II	OEC	3	0	0	3	40	60	100
A6CY08	Cryptography and Network Security Lab	PCC	0	0	2	1	40	60	100
A6CT04	Research Project Phase -1	PWC	0	0	8	4	100	0	100
TOTAL			15	0	10	20	340	360	700
IV YEAR II SEMESTER									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		CIE	SEE	Total
A6HS15	Organizational Behavior	PCC	3	0	0	3	40	60	100
PEC	Professional Elective-VI	PEC	3	0	0	3	40	60	100
OEC	Open Elective-III	OEC	3	0	0	3	40	60	100
A6CT05	Research Project Phase-2	PWC	0	0	16	11	40	60	100
TOTAL			9	0	16	20	160	240	400

**ACADEMIC REGULATIONS
AND
COURSE STRUCTURE**
CHOICE BASED CREDIT SYSTEM
R-22

Master of Technology (M.Tech)

**M. Tech. - Regular Two Year Degree Program
(For batches admitted from the academic year 2020 - 2021)**



MLR Institute of Technology

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COURSE STRUCTURE
AEROSPACE ENGINEERING

M.Tech I Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
B47601	Aerodynamics of Flight Vehicles	CC	3	-	-	3	30	70	100
B47602	Flight Vehicle Structures	CC	3	-	-	3	30	70	100
B47603	Aerospace Propulsion	CC	3	-	-	3	30	70	100
	Professional Elective - I	PE	3	-	-	3	30	70	100
	Professional Elective – II	PE	3	-	-	3	30	70	100
B47610	Aerodynamics and Propulsion Lab	CC	-	-	3	1.5	30	70	100
B47611	Aero Structures Simulation Lab	CC	-	-	3	1.5	30	70	100
	Audit Course-I	AC	2	-	-	-	30	70	100
TOTAL			17	-	6	18	240	560	800

M.Tech II Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
B47612	Advanced Finite Element Methods	CC	3	-		3	30	70	100
B47613	Avionics	CC	3	-		3	30	70	100
B47614	Computational Approaches to Aerospace Vehicle Design	CC	3			3	30	70	100
	Professional Elective – III	PE	3	-		3	30	70	100
	Professional Elective – IV	PE	3	-		3	30	70	100
B47621	Composite materials and Structures Lab	CC	-	-	3	1.5	30	70	100
B47622	Flow Simulation Lab	CC	-	-	3	1.5	30	70	100
	Audit Course -II	AC	2	-	-	-	30	70	100
TOTAL			17	-	6	18	240	560	800

M.Tech III Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
	Professional Elective –V	PE	3	-		3	30	70	100
	Open Elective – I	OE	3	-		3	30	70	100
B47630	Technical Seminar	SEM	2	-	-	2	100	-	100
B47631	Dissertation Phase-I	PWC	-	-	1	8	100	-	100
TOTAL			8	-	1	16	260	140	400

M.Tech IV Semester									
Course Code	Course Title	Category	Hours per			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B47632	Dissertation Phase-II	PWC	-	-	3	16	50	150	200
TOTAL			-	-	3	16	50	150	20

PROFESSIONAL ELECTIVES			
PE-I		PE-II	
B47604	Numerical Heat transfer	B47607	Space mechanics
B47605	Mathematical Modelling in Aerospace Applications	B47608	Helicopter Aerodynamics
B47606	Continuum Mechanics	B47609	Flight Navigation and Surveillance Systems
PE-III		PE-IV	
B47615	Advanced composites Mechanics of Composites	B47618	Cryogenic Engineering
B47616	Hypersonic Aerodynamics	B47619	Experimental stress analysis
B47617	Flight vehicle Design	B47620	Aero elasticity
PE-V			
B47623	Fatigue and Fracture Mechanics		
B47624	Computational Structural Analysis		
B47625	Engineering Plasticity		

AUDIT COURSE-I	
B4AC01	English for Research Paper Writing
B4AC02	Research Methodology And IPR
AUDIT COURSE-II	

B4AC03	Disaster Management	
B4AC04	Constitution of INDIA	
OPEN ELECTIVES		
B47626	Air Transportation Systems	Aerospace Engineering
B47627	Thermal analysis of aerospace structures	
B47628	Satellite technology	

R-22 M.Tech (Embedded Systems)
COURSE STRUCTURE

I M.Tech I Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B55501	Microcontrollers for Embedded System Design	PCC	3	0	0	3	40	60	100
B55502	RTL Simulation And Synthesis With PLDs	PCC	3	0	0	3	40	60	100
	Professional Elective Course-I	PEC	3	0	0	3	40	60	100
	Professional Elective Course-II	PEC	3	0	0	3	40	60	100
B55503	Microcontrollers for Embedded System Design Lab	PCC	0	0	4	2	40	60	100
B55504	VLSI Design Verification and Testing Lab	PCC	0	0	4	2	40	60	100
B55505	Research Methodology and IPR	PCC	2	0	0	2	40	60	100
	Audit Course-I	AC	2	0	0	0	40	60	100
Total			16	0	8	18	320	480	800
I M.Tech II Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B55506	System Design with Embedded Linux	PCC	3	-	-	3	40	60	100
B55507	VLSI Design Verification and Testing	PCC	3	-	-	3	40	60	100
	Professional Elective Course-III	PEC	3	-	-	3	40	60	100
	Professional Elective Course-IV	PEC	3	-	-	3	40	60	100
B55508	Advanced Embedded Systems Lab	PCC	-	-	4	2	40	60	100
B55509	System Design with Embedded Linux Lab	PCC	-	-	4	2	40	60	100
B55510	Seminar	PCC	0	0	4	2	100	-	100
	Audit Course-II	AC	2	-	-	-	40	60	100
Total			14	0	12	18	380	420	800

II M.Tech I Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
	Professional Elective Course-V	PEC	3	-	-	3	40	60	100
	Open Elective Course	OEC	3	-	-	3	40	60	100
B55511	Dissertation Work Review -I	PWC	-	-	12	6	100	-	100
Total			6	0	12	12	180	120	300

II M.Tech II Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B55512	Dissertation Work Review -II	PWC	0	0	12	06	50	-	50
B55513	Dissertation Viva-Voce	PWC	0	0	28	14	-	150	150
Total			0	0	40	20	50	150	200

PROFESSIONAL ELECTIVES			
PE-I		PE-II	
B55514	CMOS VLSI Design	B55517	Embedded Real Time Operating System
B55515	Pattern Recognition and Machine Learning	B55518	Advanced Computer Architecture
B55516	Wireless Sensor Networks	B55519	CMOS Analog IC Design
PE-III		PE-IV	
B55520	IoT Architecture and system design	B55523	Device Drivers of Embedded Systems
B55521	SoC Design	B55524	Network Security and Cryptography
B55522	Linux OS	B55525	Embedded Systems and IOT
PE-V			
B55526	Data Communication Networks		
B55527	Digital Signal Processors and Architectures		
B55528	Embedded Networking		
OPEN ELECTIVES			
B55529	Principles of signal Processing		
B55530	Applications of IoT		
B55531	Waste to Energy		
AUDIT COURSE I and II			
B5AC01	English for Research Paper Writing	B5AC05	Disaster Management
B5AC02	Sanskrit for Technical Knowledge	B5AC06	Constitution of India
B5AC03	Value Education	B5AC07	Pedagogy Studies
B5AC04	Stress Management by Yoga	B5AC08	Personality Development Through Life Enlightenment Skills

COURSE STRUCTURE

CHOICE BASED CREDIT SYSTEM

R22

Master of Business Administration (MBA)

MBA - Regular Two Year Degree Program
(For batches admitted from the academic year 2022 - 2024)



MLR Institute of Technology

(Autonomous)

Laxman Reddy Avenue, Dundigal
Hyderabad – 500043, Telangana State
www.mlrit.ac.in Email: director@mlrinstitutions.ac.in

COURSE STRUCTURE

I Semester

Course Type	Course Code	Course Title	CIE	SEE	L	T	P	C
Core course	C50001	Management and Organizational Behavior	30	70	4	0	0	4
Core course	C50002	Business Economics	30	70	4	0	0	4
Core course	C50003	Financial Accounting and Analysis	30	70	4	0	0	4
Core course	C50004	Research Methodology and Statistical Analysis	30	70	4	0	0	4
Core course	C50005	Legal and Business Environment	30	70	4	0	0	4
Core course	C50006	Business Ethics and Corporate Governance	30	70	4	0	0	4
Core course	C50007	Business Communication	30	70	4	0	0	2
Seminar	C50008	Seminar (Company Analysis)	100	-	0	0	2	1
Total			310	490	29	0	2	27

II Semester

Course Type	Course Code	Course Title	CIE	SEE	L	T	P	C
Core course	C50009	Human Resource Management	30	70	4	0	0	4
Core course	C50010	Marketing Management	30	70	4	0	0	4
Core course	C50011	Financial Management	30	70	4	0	0	4
Core course	C50012	Entrepreneurship	30	70	4	0	0	4
Core course	C50013	Quantitative Analysis for Business Decisions	30	70	4	0	0	4
Core course	C50014	MIS and ERP	30	70	4	0	0	4
Lab Course	C50015	IT for Managers Lab	30	70	0	0	3	2
Seminar	C50016	Seminar (Industry Analysis)	100	-	0	0	2	1
Total			310	490	24	0	5	27

***Summer Internship:** Students have to undergo Internship during Summer Vacation.

III Semester

Course Type	Course Code	Course Title	CIE	SEE	L	T	P	C
Core course	C50017	Management of Technology	30	70	4	0	0	4
Core course	C50018	Production and Operations Management	30	70	4	0	0	4
Core course	C50019	Data Analytics	30	70	4	0	0	4
Subject Elective		Subjective Elective – I	30	70	4	0	0	4
Subject Elective		Subjective Elective – II	30	70	4	0	0	4
Subject Elective		Subjective Elective – III	30	70	4	0	0	4
Seminar	C50032	Internship and Seminar *	100	-	0	0	3	2
Total			280	420	24	0	3	26

IV Semester

Course Type	Course Code	Course Title	CIE	SEE	L	T	P	C
Core Course	C50033	Strategic Management	30	70	4	0	0	4
Subject Elective		Subjective Elective – IV	30	70	4	0	0	4
Subject Elective		Subjective Elective – V	30	70	4	0	0	4
Subject Elective		Subjective Elective – VI	30	70	4	0	0	4
Subject Viva	C50046	Comprehensive Subject Viva-Voce	-	100	0	0	2	1
Seminar	C50047	Pre submission of Project Seminar	100	-	2	0	0	1
Project	C50048	Real/Research Oriented Project	30	70	0	0	3	4
Total			250	450	18	0	5	22

LIST OF PROGRAM ELECTIVE SUBJECTS

Students have to select any One Specialization (Marketing, Finance, Human Resources, and Entrepreneurship) and he/she needs to select the Program Elective subjects listed under the chosen specialization only.

Program Elective Specialization					
Course Type	Details	Marketing	HRM	Finance	Entrepreneurship
Subjective Elective - I	Course Code	C50020	C50021	C40022	C40023
	Course Title	Consumer Behaviour	Performance Management Systems	Security Analysis and Portfolio Management	Start Up Management
Subjective Elective - II	Course Code	C50024	C50025	C50026	C50027
	Course Title	Services Marketing	Learning and Development	Financial Institutions, Markets and Services	MSME Management
Subjective Elective - III	Course Code	C50028	C50029	C50030	C50031
	Course Title	Advertising and Sales Management	Management of Industrial Relations	Strategic Management Accounting	Family Business Management
Subjective Elective - IV	Course Code	C50034	C50035	C50036	C50037
	Course Title	International Marketing	International Human Resource Management	International Financial Management	Entrepreneurial Finance
Subjective Elective - V	Course Code	C50038	C50039	C50040	C50041
	Course Title	Digital Marketing	Talent and Knowledge Management	Strategic Investment and Financing Decisions	Entrepreneurial Marketing
Subjective Elective - VI	Course Code	C50042	C50043	C50044	C50045
	Course Title	Retail Management	Leadership and Change Management	Risk Management and Financial Derivatives	Creativity Innovation and Entrepreneurship

Open Elective Courses

Course Code	Open Elective Course-1	Course	Open Elective Course-2
C50006	Business Ethics and Corporate Governance	C50018	Total Quality Management
C50007	Project Management	C50019	Marketing Research
C50008	Sustainability Management	C50020	International Business
C50009	Cross Cultural Management	C50021	Management of Technology

Academic Regulations, Course Structure & Detailed Syllabus

CHOICE BASED CREDIT SYSTEM

R22

DEPARTMENT OF
MECHANICAL ENGINEERING
FOR

Master of Technology (M.Tech.)

Thermal Engineering

M. Tech. - Regular Two Year Degree Program

(For batches admitted from the academic year 2022 - 2023)



MLR Institute of Technology

(Autonomous)

Laxman Reddy Avenue, Dundigal Hyderabad – 500043, Telangana State

www.mlrinstitutions.ac.in, Email: director@mlrinstitutions.ac.in

COURSE STRUCTURE

M.Tech. - Thermal Engineering (R22)

I M.Tech I Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B52101	Advanced Thermodynamics	PCC	3	0	0	3	40	60	100
B52103	Advanced Fluid Mechanics	PCC	3	0	0	3	40	60	100
	Professional Elective - I	PEC	3	0	0	3	40	60	100
	Professional Elective - II	PEC	3	0	0	3	40	60	100
B5HS01	Research Methodology & IPR	ESC	2	0	0	2	40	60	100
B52102	Advanced Thermal Engineering lab	PCC	0	0	4	2	40	60	100
B52104	Advanced Fluid Mechanics Lab	PCC	0	0	4	2	40	60	100
	Audit Course-I	MC	2	0	0	0	40	60	100
TOTAL			16	0	8	18	320	480	800

I M.Tech II Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B52107	Advanced Heat and Mass Transfer	PCC	3	0	0	3	40	60	100
B52109	Computational Fluid Dynamics	PCC	3	0	0	3	40	60	100
	Professional Elective-III	PEC	3	0	0	3	40	60	100
	Professional Elective-IV	PEC	3	0	0	3	40	60	100
B52111	Mini Project with Seminar	PWC	0	0	4	2	100	0	100
B52108	Advanced Heat Transfer Lab	PCC	0	0	4	2	40	60	100
B52110	Computational Methods Lab	PCC	0	0	4	2	40	60	100
	Audit Course-II	MC	2	0	0	0	40	60	100
TOTAL			14	0	12	18	380	420	800

II M.Tech I Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
	Professional Elective-V	PEC	3	0	0	3	40	60	100
	Open Elective	OEC	3	0	0	3	40	60	100
B52113	Dissertation Work Review-I	PWC	0	0	12	6	100	0	100
TOTAL			6	0	12	12	180	120	300

II M.Tech II Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B52114	Dissertation Work Review-II	PWC	0	0	12	6	100	0	100
B52115	Dissertation Viva-Voce		-	-	28	14	0	100	100
TOTAL			0	0	40	20	100	100	200

PROFESSIONAL ELECTIVE COURSES									
PE- I					PE- II				
B52116	Fuels & Combustion				B52119	Advanced I.C. Engines			
B52117	Electric & Hybrid Vehicles				B52120	Gas turbines & Jet Propulsion			
B52118	Experimental Methods in Thermal Engineering				B52121	Nano Fluids			
PE- III					PE- IV				
B52122	Finite Element Analysis				B52125	Cogeneration & Waste Heat Recovery Systems			
B52123	Optimization Techniques & Applications				B52126	Renewable Energy Sources			
B52124	Utilization of Solar energy				B52127	Energy conservation and Management			
PE- V									
B52128	Refrigeration & HVAC								
B52129	Gas Dynamics								
B52130	Equipment Design for Thermal Systems								

OPEN ELECTIVES FOR OTHER DEPARTMENTS									
B52135	Industrial Safety								
B52136	Operations Research								

AUDIT COURSE I					AUDIT COURSE II				
B5AC01	English for Research Paper Writing				B5AC05	Disaster Management			
B5AC02	Sanskrit for Technical Knowledge				B5AC06	Constitution of India			
B5AC03	Value Education				B5AC07	Pedagogy Studies			
B5AC04	Stress Management by yoga				B5AC08	Personality Development Through Life Enlightenment Skills			

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

M.Tech. – CSE

(Course Structure – R22 Regulations)

I M.Tech I Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B55801	Mathematical Foundations of Computer Science	PCC	3	-	-	3	40	60	100
B55802	Advanced Data Structures	PCC	3	-	-	3	40	60	100
PEC - I	Professional Elective - I	PEC	3	-	-	3	40	60	100
PEC - II	Professional Elective - II	PEC	3	-	-	3	40	60	100
B55803	Advanced Data Structures Lab	PCC	-	-	4	2	40	60	100
PEC - I	Professional Elective – I Lab	PEC	-	-	4	2	40	60	100
B55813	Research Methodology & IPR		2	-	-	2	40	60	100
AC	Audit Course - I	AC	2	-	-	-	40	60	100
TOTAL			16	-	8	18	320	480	800

I M.Tech II Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B55814	Advanced Algorithms	PCC	3	-	-	3	40	60	100
B55815	Advanced Computer Architecture	PCC	3	-	-	3	40	60	100
PEC - III	Professional Elective – III	PEC	3	-	-	3	40	60	100
PEC -IV	Professional Elective – IV	PEC	3	-	-	3	40	60	100
B55816	Advanced Algorithms Lab	PCC	-	-	4	2	40	60	100
PEC - III	Professional Elective – III Lab	PEC	-	-	4	2	40	60	100
B55826	Mini Project with Seminar	PWC	-	-	4	2	40	60	100
AC	Audit Course - II	AC	2	-	-	-	40	60	100
TOTAL			14	-	12	18	320	480	800

II M.Tech I Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
PEC	Professional Elective - V	PEC	3	-	-	3	40	60	100
OEC	Open Elective	OEC	3	-	-	3	40	60	100
B55837	Dissertation Phase – I	PWC	-	-	12	6	100	-	100
TOTAL			6	-	12	12	180	120	400

II M.Tech II Semester									
Course Code	Course Title	Category	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
B55838	Dissertation Phase -II	PWC	-	-	12	6	100	100	200
B55839	Dissertation Public Viva-Voce	PWC	-	-	28	14	-	100	100
TOTAL			-	-	40	20	100	200	300

PROFESSIONAL ELECTIVES			
PE - I		PE - III	
B55804	Database Programming with PL/SQL	B55817	Enterprise Cloud Concepts
B55806	Deep Learning	B55819	Advanced Computer Networks
B55808	Natural Language Processing	B55821	Edge Analytics
B55805	Database Programming with PL/SQL Lab	B55818	Enterprise Cloud Concepts Lab
B55807	Deep Learning Lab	B55820	Advanced Computer Networks Lab
B55809	Natural Language Processing Lab	B55822	Edge Analytics Lab
PE - II		PE - IV	
B55810	Applied Cryptography	B55823	Bioinformatics
B55811	Software Quality Engineering	B55824	Nature Inspired Computing
B55812	Mining Massive Datasets	B55825	Robotic Process Automation
PE - V			
B55827	Digital Forensics		
B55828	High Performance Computing		
B55829	Quantum Computing		

OPEN ELECTIVES	
B55830	IPR
B55831	Fault Tolerance Systems
B55832	Intrusion Detection Systems
B55833	Digital Forensics
B55834	Optimization Techniques
B55835	Cyber Physical Systems
B55836	Graph Analytics

AUDIT COURSE I & II			
B5AC01	English for Research Paper Writing	B5AC05	Disaster Management
B5AC02	Sanskrit for Technical Knowledge	B5AC06	Value Education
B5AC03	Constitution of India	B5AC07	Pedagogy Studies
B5AC04	Stress Management by Yoga	B5AC08	Personality Development Through Life Enlightenment Skills

COURSE STRUCTURE

Course Structure

B. TECH – Computer Science and Engineering (Data Science)

Regulations: R22

I B.Tech.- I Semester									
Induction program for one weeks									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS01	Linear Algebra and Calculus	BSC	3	1	0	4	40	60	100
A6CS02	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A6HS01	English for Skill Enhancement	HSMC	3	0	0	3	40	60	100
A6BS09	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A6EC03	Electronic Devices and Applications	ESC	2	0	0	2	40	60	100
A6CS03	Programming for Problem Solving Lab	ESC	0	0	3	1.5	40	60	100
A6HS02	English Language and Communication Skills Lab	HSMC	0	0	3	1.5	40	60	100
A6HS04	Seminar	HSMC	0	0	2	1	50	-	50
A6BS11	Environmental Science	MC	3	0	0	-	50	-	50
TOTAL			17	2	8	20	380	420	800
I B.Tech.- II Semester									
Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS02	Numerical Methods and Integral Transforms	BSC	3	1	0	4	40	60	100
A6BS07	Applied Physics	BSC	3	1	0	4	40	60	100
A6EE60	Basic Electrical and Electronics Engineering	BSC	3	1	0	4	40	60	100
A6ME02	Engineering Drawing	ESC	1	0	3	2.5	40	60	100
A6BS08	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A6CS04	Python Programming Lab	ESC	0	0	3	1.5	40	60	100
A6ME04	Engineering Work Shop	ESC	0	0	3	1.5	40	60	100
A6DS01	Data Handling and Interpretation	ESC	0	1	2	1	50	-	50
TOTAL			10	4	14	20	330	420	750

II B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6CS08	Discrete Mathematics	BSC	3	0	0	3	40	60	100
A6CS11	Operating Systems	PCC	3	0	0	3	40	60	100
A6CS28	Digital Electronics And Computer Organization	ESC	3	0	0	3	40	60	100
A6CS09	Database Management Systems	PCC	3	0	0	3	40	60	100
A6CS05	Data structures	PCC	3	0	0	3	40	60	100
A6CS10	Database Management Systems Lab	PCC	0	0	3	1.5	40	60	100
A6CS06	Data Structures Lab	PCC	0	0	3	1.5	40	60	100
A6DS04	Skill Development Course (Data Wrangling)	PCC	0	0	4	2	100	-	100
A6HS06	Constitution of India	MC	2	-	-	0	50	-	50
Total			15	00	12	20	420	480	900

II B.Tech.- II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6BS03	Computer Oriented Statistical Methods	BSC	3	1	0	4	40	60	100
A6HS08	Business Economics and Financial Analysis	HSC	3	0	0	3	40	60	100
A6DS02	Data Analytics using R	PCC	2	0	0	2	40	60	100
A6IT02	Object Oriented Programming through Java	ESC	3	0	0	3	40	60	100
A6CS15	Design and Analysis of Algorithms	PCC	3	0	0	3	40	60	100
A6DS03	Data Analytics using R Lab	PCC	0	0	3	1.5	40	60	100
A6IT03	Object Oriented Programming through Java Lab	ESC	0	0	3	1.5	40	60	100
A6DS05	Rea-time research project / Societal Related Project	PWC	0	0	4	2	50	-	50
A6HS05	Gender Sensitization	MC	2	-	-	0	50	-	50
Total			14	01	10	20	360	540	900

III B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6DS06	Big Data Analytics	PCC	3	0	0	3	40	60	100
A6IT11	Automata and Compiler Design	PCC	3	0	0	4	40	60	100
A6AI07	Web Programming	PCC	3	0	0	3	40	60	100
	Professional Elective-I	PEC	3	0	0	3	40	60	100
A6CS07	Software Engineering	PCC	3	0	0	3	40	60	100
A6AI08	Web Programming Lab	PCC	0	0	3	1.5	40	60	100
A6DS07	Big Data Analytics Lab	PCC	0	0	3	1.5	40	60	100
A6DS08	Skill Development(NoSQL Databases)	PCC	0	0	0	1	40	60	100
A6HS10	Human Values and Professional Ethics	MC	2	-	-	-	50	-	50
Total			15	00	08	20	360	540	900

III B.Tech.- II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6AI02	Artificial Intelligence	PCC	3	1	0	4	40	60	100
A6CS07	Computer Networks	PCC	3	0	0	3	40	60	100
	Professional Elective-II	PEC	3	0	0	3	40	60	100
	Professional Elective-III	PEC	3	0	0	3	40	60	100
	Open Elective-I	OEC	3	0	0	3	40	60	100
A6AI03	Artificial Intelligence Lab	PCC	0	0	3	1.5	40	60	100
	Professional Elective-II Lab	PEC	0	0	3	1.5	40	60	100
A6BS11	Environmental Science	MC	2	-	-	0	50	-	-
Total			15	01	08	20	320	480	800

IV B.Tech.- I Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6A117	Deep Learning	PCC	3	0	0	3	40	60	100
A6DS15	Web and Social Media Analytics	PCC	3	0	0	3	40	60	100
	Professional Elective-IV	PEC	3	0	0	3	40	60	100
	Professional Elective-V	PEC	3	0	0	3	40	60	100
	Open Elective-II	OEC	3	0	0	3	40	60	100
A6A119	Deep Learning Lab	PCC	0	0	2	1	40	60	100
A6DS29	Research Project Phase - 1	PCC	0	0	8	4	100	-	100
Total			15	00	10	20	280	420	700

IV B.Tech. - II Semester									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A6HS15	Organizational Behaviour	HSMC	3	0	0	3	40	60	100
	Professional Elective-VI	PEC	3	0	0	3	40	60	100
	Open Elective - III	OEC	3	0	0	3	40	60	100
A6DS30	Research Project Phase - 2	PCC	0	0	16	9 + 2	40	60	100
Total			09	00	16	20	160	240	400

SEM	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	20	20	20	20	20	20	20	160

PROFESSIONAL ELECTIVES			
PE - I		PE - II	
A6AI11	Data Mining Techniques	A6AI02	Artificial Intelligence
A6DS09	Exploratory Data Analytics	A6DS23	Internet Of Things(IOT)
A6DS10	ETL Tools	A6DS13	Data Wrangling
A6DS11	Python for Data Science	A6DS25	Object Oriented Analysis and Design(OOAD)
PE - III		PE - IV	
A6CS29	Cloud Computing	A6AI14	Natural Language Processing
A6DS28	Predictive Analytics	A6DS16	Data Base Security
A6AI29	Devops	A6DS17	Time Series Analysis and Forecasting
A6IT10	Full Stack Development	A6DS18	Edge Analytics
PE - V		PE - VI	
A61T26	IRS	A6DS21	Data Visualization using Tableau
A6DS19	Video Analytics	A6DS22	Business Intelligence and Analytics
A6CY25	Block Chain Technology	A6IT33	E-Commerce
A6DS20	Data Collection and Analysis with IOT	A6DS27	BigData Management
PE - II LAB			
A6AI03	Artificial Intelligence Lab		
A6DS24	Internet Of Things(IOT) Lab		
A6DS14	Data Wrangling Lab		
A6DS26	Object Oriented Analysis and Design(OOAD) Lab		

