ACADEMIC REGULATIONS (R20)

COURSE STRUCTURE

&

DETAILED SYLLABUS

(I YEAR)

ELECTRICAL & ELECTRONICS ENGINEERING

For
B.Tech., Four Year Degree Course
(Applicable for the batches admitted from 2020-21)

LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution
Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC with "A" Grade and NBA (ECE, CSE, EEE & ME)
Jonnada (Village), Denkada (Mandal), Vizianagaram Dist – 535 005
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Foreword

I am delighted to emphasize about the Academic Regulations (R20), Course Structure and syllabi for B.Tech Program of Lendi Institute of Engineering & Technology under autonomous. At the outset, I thank the Management for giving me this opportunity to share my knowledge and experience in designing the curriculum of this esteem institution. Lendi Institute of Engineering and Technology began its journey in 2008, fortified by vigorous leadership, prudent planning and investment in libraries, information technology and infrastructural facilities - the institution progressively opted for autonomy with the only purview of academic enrichment and continuous support to emerging graduates.

Days of assessing student's calibre through 'Scoring Centum' is now replaced with conceptual knowledge and professional skills to meet the industry requirements/higher education. In view of the above, this curriculum and syllabi are designed for effective implementation of the outcome-based education.

The Technical Skill Development and Employability Skill Development courses with hands on experience are introduced in the curriculum for readiness of the industry requirements. Meeting with the global requirements, to inculcate the habit of self-learning and in compliance with UGC guidelines, MOOC (Massive Open Online Course) have been introduced. As a part of curriculum in all branches of engineering, it is mandatory for all students to undergo Summer Internship at industries (core or allied) / R & D organization to get practical insight of their subject domain during summer break after the 4th semester. Further, we introduced Community Service Project in the curriculum to address the solutions of contemporary societal issues.

We strongly believe that the graduate certainly acquires analytical and critical skills with mastering factual practical knowledge through this curriculum. Working with a noble vision of the institution, mission of developing technocrats to solve the societal problems, we are working progressively towards ensuring that our students are raised to adapt to the dynamics of the future, whilst paving their way towards excellence.

I greatly aspire that this Holistic approach at Lendi will lead us to greater heights of glory in the forthcoming years ahead. I trust this syllabus would train the students in pursuit of excellence through our pioneering education model.

"Excellence is not an act, but a habit"- Aristotle.

Dr. V V Rama Reddy
Principal

About Lendi Institute of Engineering & Technology

Lendi Institute of Engineering & Technology is a premiere Institution established in 2008 by a divine body of committed intelligentsia under the aegis of Saidhamam Educational Trust of Vizianagaram to cater to the needs of young graduates of technology. It is on national highway near to both Visakhapatnam and Vizianagaram having a lush green campus with eco-friendly environment. Its aim is to create a unique scenario of eligible and elegant engineers to be brought out into the society to compete with and complete the realistic technological needs of India.

Lendi Institute of Engineering & Technology is spread to all directions with strength of over 2600+ students and above 160 faculties. Under the guidance of Dr. V.V. Rama Reddy, Principal, having three decades of teaching and administrative experience, Lendi offers ECE, EEE, CSE, CSSE, CSIT & MECH courses. Lendi is famous for its teaching traits in its debutant year itself with its efficient and experienced faculty members dedicated in teaching, best in class infrastructural facilities, encouraging students to have practical exposure, individual attention etc. Lendi offers counseling to the identified slow learners, student teacher adoption program, allocation of projects to the students during vacation for the practical exposure, supplying Manuals for lucidity in the practical work. With an in-house Training and Placement Cell, Lendi offers campus recruitment training for acquiring various job opportunities along with engineering degree.

A Few Milestones:

1. The year of Establishment of Saidhamam Educational Trust is December, 2007
2. The year of Establishment of Lendi Institute of Engineering & Technology is 2008
3. Lendi Institute of Engineering & Technology is approved by AICTE, New Delhi with Six UG B.Tech Programs (ECE, EEE, CSE, ME,CSIT and CSSE) with intake of 180 for ECE& CSE, 120 for EEE & ME, 60 for CSSE, 60 for CSIT and four PG M.Tech Program (Computer Science and Engineering, Embedded Systems & VLSI Design, Power System & Control Automation and Machine Design) with intake of 18 for each M.Tech Programs in the years 2018-2019.
4. Lendi Institute of Engineering & Technology is affiliated to Jawaharlal Nehru Technological University Kakinada (JNTUK), Kakinada from 2008-2017 and is permanently affiliated to Jawaharlal Nehru Technological University Kakinada (JNTUK), Kakinada from 2018-19.
5. Lendi Institute of Engineering & Technology is accredited by NAAC with "A" Grade from June, 2017.
6. Lendi Institute of Engineering & Technology is accredited by NBA with four branches.
7. Lendi Institute of Engineering & Technology is included under the Section of UGC 2(f) & 12 (B) in the year 2018-19.
8. Lendi Institute of Engineering & Technology got conferment of Autonomous Status for 10 years by UGC & JNTUK in the year 2019.

9. Every year 625+ offers and 400+ students are placed in various reputed industries from Lendi Institute of Engineering & Technology.
10. Lendi Institute of Engineering & Technology organizes various social activities every year and it adopted nearby villages for overall skill development among students.
11. Lendi Institute of Engineering & Technology conducts various seminars/conferences/skill development programs throughout the academic cycles.
12. Lendi Institute of Engineering & Technology recognized with 'A' Grade by Andhra Pradesh State Council of Higher Education.
13. Andhra Pradesh State Skill Development Center is established at Lendi Institute of Engineering & Technology and it is recognized as Skill Development center in Vizianagaram district.

About Autonomous

1. Introduction:

The Academic Autonomy to Colleges in Higher Education is an imperative methodology to fulfill the needs of all Stakeholders of the Institution. The Engineering College promotes excellence in academics with autonomy that leads to produce globally competent engineers. Universities, with many colleges affiliated to them are unable to cater for the varied needs of individual colleges under common system, irrespective of their inherent strengths, weaknesses and locations thus affecting the academic development of individual colleges. The academic autonomy provides an opportunity for academic flexibility to periodically review the course contents and mechanisms of teaching methodologies in the light of the changing demands of the industry. The effective implementation of innovations and new academic structures to meet the societal and industrial desires shall be possible through academic autonomy of the Institution. Under autonomy, an Institute can aim at giving freedom to the faculty in curriculum design and development, preparing learning materials, bringing innovations in conduct of examinations, encouraging the research activities among the faculty and students, effective implementation of outcome based education and choice based credit systems. All these efforts go a long way for improving the performance of the students and their employability.

2. Aims and Objectives:

Quality of Education:

- To maintain this Institution as a center of excellence in technical education.
- To sustain and ameliorate the present Accreditation status by NBA, NAAC to get International Accreditations.

Academic Flexibility:

- To transfer the appropriate technology to the rural youth.
- To impart strong Engineering knowledge, technical skills and life skills to become globally competent engineer/ entrepreneur and researcher.
- To make the programme more interdisciplinary aiming at a holistic learning process.

Industry Interaction:

- To tie up with multinational industries to make the students an industry ready person.
- To encourage students to undertake projects based on market and industry needs.
- To encourage consultancy and testing to generate additional revenues.

Research & Development:

To promote research activities among students and faculty that endow with solutions to engineering problems for sustainable development of society.

Innovative Teaching-Learning Methods:

- To inculcate the self-learning skills among the students as part of life-long learning to adapt rapidly changing technology.
- To develop scientific temper among the students with socio-ethical values, leadership roles by meeting environmental and socio-economical needs.
- To design the curriculum, relevant to present day industry needs and challenges.
- To adopt innovative teaching – learning methodologies.
- To impart personality development skills among students that will help them to succeed and lead.

Objectives for Redesigned Curriculum of B.Tech

As per the guidelines of , the AP State Council of Higher Education (APSCHE), Lendi institute of Engineering and Technology took up the strenuous task of redesigning the Engineering Curriculum in tune with the National Education Policy (NEP-2020) to equip the students with the required skills and make them industry ready through enhance employability of engineering graduates by providing quality education.

The Highlights in Redesigned Curriculum of B.Tech

(1) B.Tech. with Honors or a B.Tech. with a Minor:

- B.Tech with Honors and B.Tech with a Minor are introduced in the curriculum of B.Tech.
- This is to give an opportunity for the fast learners to earn additional credits either in the same domain or in a related domain, making them more proficient in their chosen field of discipline or be a graduate with multidisciplinary knowledge and job ready skills.

(2) Skill Oriented Courses:

- The Engineering curriculum is revised with an objective to fill the gaps in the existing curriculum with reference to skill development.
- The curriculum mandates students to take up five skill courses which are relevant to the industry from second year onwards, two basic level skill courses, one on soft skills and other two on advanced level skill courses.

(3) Summer Internships (after II-II, III-II):

- Mandatory Internship, both industry and social, are included in the revised curriculum that aims at making engineering graduates connect with the needs of the industry and society at large.
- It will be mandatory for the students to intern in the industry/field during the summer vacation and also in the final semester to acquire the skills required for job.

INSTITUTION

Vision

Producing globally competent and quality technocrats with human values for the holistic needs of industry and society.

Mission

- Creating an outstanding infrastructure and platform for enhancement of skills, knowledge and behaviour of students towards employment and higher studies.
- Providing a healthy environment for research, development and entrepreneurship, to meet the expectations of industry and society.
- Transforming the graduates to contribute to the socio-economic development and welfare of the society through value based education.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Vision

To be a hub for imparting knowledge, skills, and behaviour for exemplary contributions in the field of Electrical and Electronics Engineering

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Mission

- To impart Technical Education through the state-of-the-art infrastructure facilities, laboratories and instruction.
- To inculcate industry oriented learning through industrial visits, internships, projects at Industries, MOUs, to make students' technically skills oriented.
- Creating conducive environment for higher education, employment and entrepreneurship through quality education, professional skills and research.
- To promote societal commitment among students by inculcating moral and ethical values.

Program Educational Objectives (PEOs)

- Graduates shall have strong foundation in core and allied Electrical and Electronics Engineering, in sciences and mathematics, to become globally competent in designing, modelling and critical problem solving.
- Graduates shall involve in research activities in the field of electrical and electronics engineering through lifelong learning and provide solutions to engineering problems for sustainable development of society.
- Graduates shall have good communication skills and socio-ethical values for getting employment or higher studies by excelling in competitive examinations and be able to work in supportive and leadership roles.

Program Outcomes (POs)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

1. Capable of design, develop, test, verify and implement electrical and electronics engineering systems and products.
2. Succeed in national and international competitive examinations for successful higher studies and employment.

Academic Regulations (R20) for Four years B.Tech (U.G) Program

The following academic regulations will be applicable to the students admitted into First Year of B. Tech. (Regular, with Honors/Minors) from the Academic Year 2020-21 under Autonomous system.

1. **Eligibility for Admission**:
   a. **I Year B.Tech (U.G):** The total seats available as per the AICTE approved intake are grouped into two categories (i.e) Category A and Category B in the ratio of 70:30 as per Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservation policy.
      - Under Category A: 70% of the seats are filled through EAMCET counseling.
      - Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE.

   b. **II Year B.Tech (U.G):** Under Lateral Entry Scheme students with Diploma/ B.Sc qualification have an option of direct admission into 2nd year B.Tech. (Lateral Entry Scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats as per Andhra Pradesh State Council for Higher Education (APSCHE). Admissions to this three year B.Tech Lateral Entry Programme take place through ECET as per government policy.

2. **Duration of the Programme:**
   a. **B.Tech (U.G):** The course duration for the award of the Degree in Bachelor of Technology will be 4 academic years, with two semesters in each year. However, if a student is unable to complete the course within 4 years, he/she can do so by giving more attempts but within 8 consecutive academic years from the date of admission.
   b. **B.Tech (U.G) Under Lateral Entry:** The course duration for the award of the Degree in Bachelor of Technology will be 3 academic years, with two semesters in each year. However, if a student is unable to complete the course within 3 years, he/she can do so by giving more attempts but within 6 consecutive academic years from the date of admission.

3. **Medium of Instruction:** The medium of instruction of the entire B. Tech undergraduate programme in Engineering & Technology (including examinations and project reports) will be in English only.

4. **Programme Pattern:**
   a. Total duration of the of B. Tech (Regular) Programme is four academic years
   b. Each Academic year of study is divided in to **two semesters**.
   c. Minimum number of instruction days in each semester is 90.
   d. Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
   e. The total credits for the Programme is160.
   f. Induction program is mandatory for all first year UG students and shall be conducted as per AICTE/UGC guidelines.

g. Student is introduced to "Choice Based Credit System (CBCS)".
h. A student has to register for all courses in a semester.
i. All the registered credits will be considered for the calculation of final CGPA.
j. Each semester has– "Continuous Internal Evaluation (CIE) "and "Semester End Examination (SEE)". Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

5. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5credits

6. Award of B. Tech. Degree:

A student will be declared eligible for the award of B. Tech. Degree if he/she fulfills the following academic regulations:

a. Student pursues a course of study in not less than four and not more than eight academic years.
b. After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.
c. The Student shall registerfor160creditsand secures allthe160credits.
d. A student shall be eligible for the award of **B.Tech degree with Honors or Minor** if he/she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

7. Courses of Study:

The following courses of study are offered at present as specializations for the B. Tech. Courses with English as medium of Instruction.

S. No	Branch	Branch Code
01	Electrical and Electronics Engineering	EEE
02	Mechanical Engineering	MEC
03	Electronics and Communication Engineering	ECE
04	Computer Science and Engineering	CSE
05	Computer Science and Systems Engineering	CSS
06	Computer Science and Information Technology	CIT

8. Structure of B.Tech(Regular) Program

S. No.	Category	Breakup of Credits (Total 160)
1	Basic Science Courses(BS)	21
2	Engineering Science Courses(ES)	24
3	Humanities, Social Sciences including Management(HM)	10.5
4	Professional Core Courses (PC)	51
5	Professional Elective Courses (PE)	15
6	Open Elective Courses(OE)	12
7	Skill Oriented Courses (SC)	10
8	Project Work (PJ)	12
9	Summer Internships Course(SI)	4.5
10	Mandatory Courses (MC)	(non-credit)
	Total	160

9. Structure of B.Tech with Honors Program:

a. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

b. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2ndsemester without any backlogs. In case of the declaration of the3rdsemester results after the commencement of the 4thsemester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme. The lateral entry students, who obtained First class with 8.0 CGPA or 80% in their diploma course (Polytechnic).

c. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

d. In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B.Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160credits).The lateral entry students shall be eligible for the award of **B.Tech degree with Honors** if he/she earns 20 credits in addition to the 121 credits.

e. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board ofstudies.

f. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

g. The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

h. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

i. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the Institution / academic council.

j. The concerned BoS shall also consider courses listed under professional electives of the respective B.Tech programs for the requirements of B.Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

k. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

l. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

m. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

10. Structure of B.Tech with Minors Program:

a. (i) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Computer Science

and Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Computer Science and Engineering

(ii)Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

b. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

c. The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

d. The Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

e. The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the studentsmaybepermittedtoregisterfortheequivalentMOOCcoursesasapprovedby the concerned Head of the department in consultation with BoS.

f. A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) up to the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails toacquire8SGPAupto3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

n. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160credits).The lateral entry students shall be eligible for the award of **B.Tech degree with Minor** if he/she earns 20 credits in addition to the 121 credits.

g. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

h. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If

the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the institution/academic council.

i. Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

j. Departmental level committee should be evaluating the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

k. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

l. In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

m. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

11. Program Structure, Method of Evaluation &Distribution and Weightage of Marks:

The Outcome Based Curriculum Structure consists of courses of study viz. Theory, Practical, Drawing, Socially relevant projects, Mini project, Project, Mandatory courses, Skill oriented courses, MOOCs, Summer Internship. Under Choice Based Credit System (CBCS), the students also have the flexibility to choose one elective from the list of open electives offered by other branches of engineering technology in consultation with their respective departments.

a. Theory Subject: The performance of a student in each semester shall be evaluated subject–wise with a maximum of 100 marks for theory subject. The distribution shall be 30 marks for Internal Evaluation and 70 marks for the Semester End -Examinations.

(i) Internal Evaluation:

i. The weightage of Internal marks for 30consists of Descriptive–20, Quiz-5 and Assignment-5(Theory).
ii. Two descriptive examinations shall be conducted during the semester for theory subjects.
iii. As the syllabus is framed for 5 units, the 1st and 2nd mid examinations (Descriptive exam) are conducted on 1-2½ units and 2½ -5 units respectively for each subject in a semester. The mid examination (Descriptive exam) question paper shall contain 3 questions and all questions need to be answered in90 minutes duration for30 marks. Further, each mid examination marks shall be scale down to 10 marks.
iv. Assignments: The weight age of Assignments is 5 marks during the semester for each theory subjects. However, maximum of 1marksshall be given for each unit.
v. Quiz: The weightage of Quiz is 5 marks during the semester for each theory subjects. However, maximum of 1marks shall be given foreach unit.
vi. Internal Marks can be calculated for 30 marks by adding themarks of 1st mid, 2ndmid, Quiz and Assignments.

(ii) Semester End -Evaluation:

i. The end semester examination is conducted covering the topics of all Units for 70 marks. And the question paper contains 5 Questions with internal choice.
ii. The question paper contains 5 Questions with internal choice. A student should be answered all Questions andeachcarrying14marks.

b. Practical Subject: The performance of a student in each semester shall be evaluated subject–wise with a maximum of 75 marks for practical subject. For practical subjects there shall be continuous evaluation during the semester for25 internalmarksand50endexaminationmarks.

(i) **Internal Evaluation:** Theinternal25marksshallbeawarded as follows: day to day work - 10 marks, Record-5 marks and the remaining10 marks to be awarded by conducting an internal laboratory test.

(ii) **External Evaluation:** The end examination shall be conducted by the teacher concerned and an external examiner nominated by the Controller of Examinations (CoE).

c. Project Work: The project work shall be carried out during the 8th semester. Projects will be taken up batch wise. Internal evaluation will be done by the Project Review Committee (PRC), comprising of HOD, project coordinator and two senior faculty members along with the project supervisor. Semester end evaluation will be done by Project Evaluation Committee (PEC) comprising of three members including HOD, project guide and an external examiner nominated by the CoE.

The performance of a student shall be evaluated subject–wise with a maximum of 200 marks for project work. Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination.

(i) Internal Evaluation: The Internal Evaluation shall be given by each student on the topic of his project and evaluated by an internal committee.

(ii) **External Evaluation:** The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year.

d. Design/Drawing Subjects: For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (20 marks for day – to – day work, and 10 marks for internal tests) and 70 marks for end examination.

(i) Internal Evaluation:

There shall be two internal tests in a Semester and the Marks for 10 can be calculated with 50% weightage for each of two tests and these are to be added to the marks obtained in day to day work.

(ii) Semester End -Evaluation:

a. The end semester examination is conducted covering the topics of all Units for 70 marks. And the question paper contains 5 Questions with internal choice.
b. The question paper contains 5 Questions with internal choice. A student should be answered all Questions andeachcarrying14marks.

e. Mandatory Courses:

Mandatory courses are those among the compulsory courses that does not carry any credits.

1. All the Regular and Lateral Entry students shall complete the mandatory courses on par with other regular courses.
2. Mandatory Courses shall be either Theory Courses or Laboratory Courses carrying a weight age of 50 Marks
3. The weight age of 50 Marks for Mandatory Theory Courses is split in the following order:

i) Descriptive Examinations (Mid-1 and Mid-2) -30 Marks
ii) Objective Examinations -10 Marks
iii) Assignments -10 Marks

3.1) Two Descriptive Examinations shall be conducted during the semester for all theory Mandatory Courses.

3.2) As the syllabus is comprised of 5 units, 1st and 2nd Mid (Descriptive) examinations shall be conducted for first 2½ units and remaining 2½ units respectively for each subject in a particular semester.

3.3) Mid Examination shall be conducted for 30 Marks of 90 Minutes duration; it shall
comprise 3 questions from different units, student shall answer all three questions.
Further marks obtained shall be scaled down to 15 Marks.

3.4) Objective Examination shall be conducted for 10 Marks of 20 minutes duration: it
shall comprise 20 Multiple Choice Questions with a weight age of ½ Mark each.

3.5) Weightage for Assignments is 10 marks, a maximum of 2 Marks shall be given to
each assignment from every unit.

4. In case of Laboratory Course (under mandatory courses)-weight age of 50 Marks shall
Include Continuous Internal Evaluation of 20 Internal Marks and Semester End Internal
Evaluation of 30 Marks.

A) **Continuous Internal Evaluation is comprised of**:
i) Day to Day Evaluation : **10 Marks**
ii) Record : **10 Marks**

B) **Semester End Internal Evaluation is comprised of Internal Examination for 20 Marks and Viva –Voce for 10 Marks**

5. Final results for Mandatory Courses shall be indicated as "Satisfactory" and shall not be considered for calculation of CGPA.
6. At the end of semester, the Descriptive Examinations Marks (2 x 15=30), Objective Examination Marks (10) and Assignments Marks (10) shall be integrated (30 + 10 +10) to finalize the 50 Internal Marks.
7. A student shall be declared to have passed Mandatory Courses only when he/she secures 40% or more in the final marks. In case of failure, a student shall appear for a Descriptive Re-Examination at every six months/ Next Semester at a mutually convenient date for the Institution/Students.
8. In case of Re-Examination, only Internal Evaluation shall be conducted and No External Evaluation shall be conducted.

Marks Percentage	Letter Grade	Level	Grade Point
≥ 40%	SA	Satisfactory	0
<40%	US	Un-Satisfactory	0

f. MOOCs:

Meeting with the global requirements and inculcate the habit of self-learning in compliance with UGC guidelines, MOOCs (Massive Open Online Course) have been introduced.

i. All departments shall declare the list of MOOCs at the beginning of semester, with duration of minimum 8 weeks in a given semester.
ii. Course content for the selected MOOCs shall be drawn from respective MOOCs links or supplied by the department. Courses shall be mentored by the faculty members while the assessment & evaluation shall be done by the BOS Chairman of the department.
iii. A student shall complete at least two MOOCs courses with minimum of 8/12 weeks duration for each course such that no credits shall be awarded upon successful completion of each MOOC.
iv. The results will be indicated with "Satisfactory" and it will not be accounted for the calculation of CGPA.

g. Summer Internship: As a part of curriculum in all branches of engineering, it is mandatory for all students to undergo two summer internship programme at industries (core or allied) / R & D organizations to get practical insight of their subject domain during summer break.

a) Two Mandatory summer internships - each of minimum EIGHT weeks duration, shall be completed at the end of second and third years respectively. The internships shall be completed by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel/Thermal power projects and software MNCs.

b) Evaluation of summer internships includes Internal and External Evaluation

i) **Internal Evaluation:** Student shall submit a summer internship report to the concerned department – which carries a weightage of 40 Marks.

ii) **External Evaluation:** Student shall appear for an oral presentation before the External Examiner carrying a weightage of 60 Marks.

c) The College shall facilitate and monitor the student internship programs. If any student fails to complete the internship, he/she will not be eligible for the award of degree, In such cases, the student shall repeat and complete the internship.

h. Skill Oriented Courses:

1. In case of Skill (Oriented/Advancement) Courses –
   i) 1 Theory Hour and 2 Practical Hours (OR)
   ii) 2 Theory Hours

   Shall be allotted as per the decision of concerned BOS.
2. Out of the 5 Skill Courses,
   i) **Two** courses of same domain shall be completed in the 2nd Year 1st Semester and 2nd Semester.
   ii) **One** shall necessarily be a soft skill course.
   iii) **Remaining Two** shall be either Skill-Advancement Courses of same domain or Job Oriented Skill Courses - This can be of interdisciplinary nature.
3. A pool of Interdisciplinary Job-oriented skill courses shall be designed by the common Board of Studies (BoS) of respective departments.

4. List of Interdisciplinary Job-oriented skill courses shall be populated in the curriculum Structure of each Engineering department, enabling the students to opt from among them.
5. Syllabus of Interdisciplinary Job-oriented skill courses shall be prepared by clearly Mentioning the pre requisite laboratory infrastructural requirements.
6. Students shall have option to choose either the skill courses

A) Offered by the Institution (OR)

B) Any certificate course offered by Industries/ Professional bodies/ APSSDC/Any Other accredited bodies - approved by the concerned BoS.

7. ***In Case of Skill Courses offered by the Institution:*** There shall be continuous evaluation during the semester for 25 Internal Marks and 75 Marks for Semester End Evaluation comprised of Internal Examination and Viva-Voce.

A) **Continuous Evaluation:** The internal 25 marks shall be awarded as follows:

i) Day to Day Evaluation : **15 Marks**
ii) Record : **10 Marks**

B) **Semester End Evaluation**: Shall Comprise of Semester End Internal Examination for **50 Marks** and Viva –Voce for **25 Marks**

(Semester end internal examination shall be conducted by an Internal Examiner along with External Examiner drawn from other institution- as decided by the BoS chairman)

8. ***In Case of Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies:*** Students can do the certificate courses in **TWO MODES:**

I) Mode A: Certificate course Without Examination: In this mode, evaluation process includes

i) **Report Submission : 25 Marks**

(BoS chairman of respective department shall appoint a committee for evaluating report submitted by the student)

ii) **Skill Based Examination : 50 Marks**

(BoS chairman of respective department shall arrange to conduct a Skill Based Examination for 50 Marks)

iii) **Viva-Voce : 25 Marks**

(BoS chairman shall appoint **an external examiner** from other institutions for conducting the viva-voce)

II) Mode B: Certificate course With Examination: In this mode, the evaluation process **includes**

i) **Report Submission : 25 Marks**

(BoS chairman of respective department shall appoint a committee for evaluating Report submitted by the student)

ii) **Skill Based Examination: 50 Marks**

(BoS chairman of respective department shall appoint a committee to scale down the awarded marks to **50** - however the recommended conversions and appropriate grades/marks are to be approved by the BOS)

iii) **Viva-Voce : 25 Marks**

(BoS chairman shall appoint **an external examiner** from other institutions for conducting the viva-voce)

9. Student shall be declared to have passed Skill Courses only when he/she secures 40% or more in the total marks. In case of failure, a student shall appear for a Skill based Re-Examination after six months/ Next Semester at a mutually convenient date of the Institution/Students.

10. Department shall mark attendance to the student doing skill course irrespective of mandatory attendance requirement calculations upon producing a valid certificate as approved by the concerned Board of Studies.

11. The Board of studies of concerned Department of Engineering shall review the skill courses offered by the institution internally as well as those offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial requirements.

i. Induction Program: Induction Program will be conducted before commencement of I year I semester class work with 2 weeks duration. If the student is admitted after induction program, then college will arrange induction program classes in the free hours. Student should attend the induction program with 75% of attendance. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., shall be included in the guidelines issued by AICTE.

j. NCC/NSS activities: A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as satisfactory or Un-satisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

S.No.	Course	Credits	Marks for Assessment	
			Internal	Semester End
1	Theory Course	3	30	70
2	Laboratory	1.5	25	50
3	Drawing Course	3	30	70
4	Elective Courses	3	30	70
5	Project Work	12	60	140
6	Summer Internship	4.5	40	60
7	Skill oriented Courses	10	25	75
8	Mandatory Courses	0	50	-

12. Attendance Requirements:

a. A student is eligible to write the semester examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
b. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee. Further, he acquires a minimum of 50% of attendance in each the subject.
c. Shortage of attendance below 65% in aggregate shall not be condoned.
d. Students whose shortage of attendance is not condoned in any semester are not eligible to write their corresponding end semester examination.
e. The maximum number of times a student can avail condonation should be 3 times in all the 8 semesters.
f. A stipulated fee shall be payable towards condonation of shortage of attendance.
g. A student who is short of attendance in semester may seek re-admission into that semester when offered within 4 weeks from the date of the commencement of class work.
h. A student will be promoted to the next semester if he/she satisfies the (i) attendance requirement of the present semester and (ii) minimum required credits.
i. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

13. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no 12.

a. A student is deemed to have satisfied the minimum academic requirements if he/she has earned the credits allotted to each theory/practical design/drawing subject/project by securing not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the internal marks and end semester examination marks.
b. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.
c. A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of the credits up to either II year I semester or II year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
d. A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits upto either II I year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.
e. A student shall register and put up minimum attendance in all 160 credits and earn all 160 credits.

14. Course Pattern:

a. The entire course of study is for four academic years; all the years are on semester pattern.
b. A student eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.
c. When a student is detained for lack of credits/shortage of attendance, he/she may be re-admitted into the same semester / year in which he has been detained. However, the academic regulations under which he/she was first admitted shall continue to be applicable to him/her.

15. Cumulative Grade Point Average (CGPA)

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Marks Range Theory (Max – 100)	**Marks Range Lab (Max – 75)**	**Letter Grade**	**Level**	**Grade Point**
≥ 90	≥ 67	A+	Outstanding	10
≥80 to <90	≥60 to <67	A	Excellent	9
≥70 to <80	≥52 to <60	B	Very Good	8
≥60 to <70	≥45 to <52	C	Good	7
≥50 to <60	≥37 to <45	D	Fair	6
≥40 to <50	≥30 to <37	E	Satisfactory	5
<40	<30	F	Fail	0
		Ab	Absent	0

i. Computation of SGPA: The following procedure is to be adopted to compute the Semester Grade Point Average. (SGPA) and Cumulative Grade Point Average (CGPA): The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA\ (Si) = \sum (Ci\ X\ Gi) / \sum Ci$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

ii. ***Computation of CGPA:*** The CGPA is also calculated in the same manner taking into account all the courses under gone by a student over all the semester of a programme, i.e.CGPA = $\sum$ (Ci X Si) / $\sum$ Ci Where Si is the SGPA of the i^{th} semester and Ci is the total number of credits in that semester.

iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iv. Equivalent Percentage =(CGPA-0.75)x10

v. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

vi. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.

16. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree, he/she shall be placed in one of the following:

Class Awarded	CGPA Secured	
First Class with Distinction	$\geq$ 7.75 (without any backlogs)	**From the CGPA Secured from 160 Credits.**
First Class	$\geq$ 6.75	
Second Class	$\geq$ 5.75 to < 6.75	
Pass Class	$\geq$ 5.0 to < 5.75	

17. Minimum Instruction Days:

For all the eight semesters a common academic calendar shall be followed in each semester by having sixteen weeks of instruction, one week for the conduct of practical exams and with three weeks for theory examinations and evaluation. Further, the minimum instruction days for each semester shall be 90 days. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in the academic plan.

18. Gap - Year: Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at college level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

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

20. Withholding of Results: If any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

21. Transitory Regulations:

a. Discontinued or detained candidates are eligible for readmission in the next following academic years.

b. A student in one academic regulation of JNTUK, detained due to lack of required number of credits or percentage of attendance at the end of any semester is permitted to take re-admission at appropriate level in any other scheme prevailing in the institute subject to the following rules and regulations.

   i. Student shall pass all the courses in the earlier scheme of JNTUK. However, in case of having backlog courses, they shall be cleared by appearing for supplementary examinations conducted by JNTUK from time to time.

   ii. After readmission, the student is required to study the courses as prescribed in the JNTUK regulations for the re-admitted program at that level and thereafter.

c. A student in one academic regulation under autonomous, detained due to lack of required number of credits or percentage of attendance at the end of any semester is permitted to take re-admission at appropriate level in any other scheme prevailing in the institute subject to the following rules and regulations.

   i. Student shall pass all the courses in the earlier scheme. However, in case of having backlog courses, they shall be cleared by appearing for supplementary examinations conducted by college in their regulations from time to time.

   ii. After readmission, the student is required to study the courses as prescribed in the new regulations for the re-admitted program at that level and thereafter.

   iii. If the student has already passed any courses of readmitted program in the earlier regulation/semester of study, such courses are exempted.

   iv. The courses that are not done in the earlier regulations/semester as compared with readmitted program need to be cleared after readmission by appearing for the examinations conducted time to time under the new regulations.

   v. In general, after transition, course composition and number of credits/semester shall be balanced between old and new regulations on case to case basis.

   vi. In case the students who do not have option of acquiring required credits with the existing courses offered as per the curriculum under autonomy, credit balance can be achieved by clearing the additional/substitute courses offered.

d. (i) In case of transferred students from other Universities, the credits shall be transferred to this institution as per the academic regulations and course structure of this institution**.**

(ii)The students seeking transfer to colleges affiliated to JNTUK from various other Universities/Institutions have to obtain the credits of any equivalent subjects as prescribed by this institution. In addition, the transferred candidates have to pass the failed subjects at the earlier institute with already obtained sectional marks to be conducted by this institution.

e. The decision of the Principal is final on any other clarification in this regard.

22. Conduct and Discipline:

a. Candidates shall conduct themselves within and outside the premises of the institute in a manner befitting the candidates of our institution.

b. As per the order of Honorable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.

23 Malpractices:

a. The Principal shall refer the cases of malpractices in internal assessment tests and semester-end examinations to a malpractice enquiry committee constituted by him / her for the purpose. Such committee shall follow the approved scales of punishment. The principal shall take necessary action, against the erring candidates basing on the recommendations of the committee.

b. Any action on the part of a candidate during an examination trying to get undue advantage or trying to help another, or drive 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 in the examination shall be viewed seriously and recommended for award of

Appropriate punishment after thorough enquiry.

24 General:

a. Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

b. The academic regulation should be read as a whole for the purpose of any interpretation.

c. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Institute academic counsel is final.

d. The Institution may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institution.

Academic Regulations for B. Tech. (Lateral Entry Scheme)

The following academic regulation will be applicable for the students admitted into II year B. Tech. from the Academic Year 2021-22 onwards.

1. **Eligibility for Admission**:

II Year B.Tech (U.G): Under Lateral Entry Scheme students with Diploma/B.Sc qualification have an option of direct admission into 2nd year B.Tech. (Lateral Entry Scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats as per Andhra Pradesh State Council for Higher Education (APSCHE). Admissions to this three year B.Tech Later Entry Programme will be through ECET as per government policy.

2. **Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations:

a. A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years.
b. The candidate shall register for 121 credits and secure all the 121 credits.
c. A student shall be eligible for the award of **B.Tech degree with Honors or Minor** if he/she earns 20 credits in addition to the 121 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

3. The attendance regulations of B.Tech.(Regular) shall be applicable to B.Tech.

4. **Promotion Rule**

a. A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.
b. A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

5. **Award of Class**

After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B.Tech Degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75 (without any backlogs)	**From the CGPA secured from121 Credits from II Year to IV Year**
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 5.00 to < 5.75	

The marks obtained in the internal evaluation and the end semester examination shall be shown separately in the marks memorandum.

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

I Year - I Semester

S. No.	Course code	Course Title	L	T	P	Credits
1	R20BSH-EN1101	Communicative English	2	0	2	3

Course Objectives:

- Educate students in the acquisition of the English language through the study of literature and other contemporary forms of culture to understand the complex dynamics of human interpersonal relationships.
- Promote the development of empathy by engaging students in a discussion of literary works, highlighting the emotional aspects of the pieces for intellectual flexibility, creativity, and cultural literacy cultivating life-long learning.
- Acquire a wide range of vocabulary, an understanding of grammar and knowledge to demonstrate students' ability to think creatively in order to express effectively.
- Adopt activity-based teaching-learning methods to ensure that learners would be engaged in the use of language both in the classroom and laboratory sessions.
- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Help improve speaking skills through participation in activities such as role-plays, discussions and structured talks/oral presentations

Course Outcomes:

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

1. Understand the value of Human Conduct for career development through life skills: Ethics & Values and use root words and Prepositions without errors. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. Enhance pronunciation with befitting tone for clarity in a speech to communicate language effectively.(L2)
2. Observe the significance of imagery in poetry to use it in real-time contexts and learn to use and misuse of Articles, Prefixes, Suffixes, and Punctuations. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. Participate in short conversations in routine contexts on topics of interest and ask questions and make requests politely. (L1)
3. Acquire conversation skills through drama and enhance the correct use of Nouns, Pronouns, Verbs and Concord to write paragraphs effectively. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. Listen for specific information, gist, note-taking, note-making and comprehension and develop convincing and negotiating skills through debates. (L2)
4. Develop reading for inspiration, interpretation & innovation and learn to use modifiers, synonyms and antonyms to write essays effectively. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. (L3)
5. Learn meaningful use of language by avoiding meaningless clichés, bureaucratic euphemisms and academic jargon in order to acquire the skill of summarising Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. (L2)

Unit I

Theory:

On the Conduct of Life: William Hazlitt: **Reading**; **Grammar**-Prepositions; **Vocabulary**-Word Formation-I; Introduction to Word Formation; **Writing**-Clauses and Sentences; **Life-Skills**: Values and Ethics. If-- Rudyard Kipling.

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--1. Strong Roots--2.Early Influences-3.Education Provides a Solid Foundation-for Extensive reading-Reading for Pleasure-Information and General Understanding

Practice:

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Unit II

Theory:

The Brook: Alfred Tennyson: Reading; Grammar-Articles; **Vocabulary**-Word Formation-II: Root Words from Other Languages; **Writing**-Punctuation; **Life-Skills**: Self-Improvement. How I Became a Public Speaker:George Bernard Shaw.

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--4.Preparing to Start a Career--5.Work Begins in Earnest--6. From Hovercraft to Rockets -for Extensive reading-Reading for Pleasure-Information and General Understanding.

Practice:

Listening: Answering a series of questions about the main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks

Unit III

Theory:

The Death Trap: Saki: Reading; Grammar-Noun-Pronoun Agreement-Subject-Verb Agreement; **Vocabulary**-Word Formation-III: Prefixes and Suffixes from Other Languages; **Writing**-Principal of Good Writing-Paragraph Writing; **Life-Skills**: Time Management- On Saving Time: Seneca

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--7.Adding Momentum to Space Research--8.Balancing Defence Technology with Space Research--for Extensive reading-Reading for Pleasure-Information and General Understanding.

Practice:

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.

Unit IV

Theory:

Chindu Yellamma: Reading; Grammar-Misplaced Modifiers;

Vocabulary-Synonyms & Antonyms; **Writing**-Essay Writing; **Life-Skills**: Innovations. Muhammad Yunus.

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--9. Dreaming of Satellites--10.The End of an Era--for Extensive reading-Reading for Pleasure-Information and General Understanding.

Practice:

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Roleplays for the practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Unit V

Theory:

Politics and the English Language-George Orwell: Reading; Grammar-Cliches and Redundancies; **Vocabulary**-Common Abbreviations; **Writing**-Writing a summary; **Life-Skills**: Motivation- The Dancer with a White Parasol: Ranjana Deva

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--11. Leading a Team--12. Dear ones Pass On--for Extensive reading-Reading for Pleasure-Information and General Understanding.

Practice:

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.

Textbooks

1. Language and Life -A skills Approach by Orient Black Swan.
2. Wings of Fire An Autobiography APJ Abdula Kalam with Arun Tiwari Abridged by Universities Press.

Suggested Books for Additional Reading

1. Technical Communication, Meenakshi Raman & Sangeeta Sharma, Oxford University Press
2. Effective Communication Skills, Kulbushan Kumar, Khanna Publishing House, Delhi
3. Communication Skills, Pushplata, Sanjay Kumar, Oxford University Press
4. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
5. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
6. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
7. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

Online References:

1. https://www.gradesaver.com/the-poetry-of-dh-lawrence/study-guide/summary
2. https://englicist.com/notes/summary-where-the-mind-is-without-fear-rabindranath-tagore.
3. http://www.authorstream.com/Presentation/cse1amity-2314117-stench-kerosene-amrita-pritam/.
4. https://www.poemhunter.com/poem/dream-love-8/comments/
5. https://www.poetryfoundation.org/collections

Sample Web Resources

Grammar/Listening/Writing

1-language.com
http://www.5minuteenglish.com/
https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online
http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/
http://www.nonstopenglish.com/
https://www.vocabulary.com/
BBC Vocabulary Games
Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/
https://www.englishclub.com/reading/short-stories.htm
https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613
http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/
BBC Learning English – Pronunciation tips
Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/
http://www.world-english.org/
http://learnenglish.britishcouncil.org/

Online Dictionaries

Cambridge dictionary online
MacMillan dictionary
Oxford learner's dictionaries

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).

2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails,letters and reports-- are to be tested along with appropriate language and expressions.

Examinations:

As part of communication practice, an activity based assessment is conducted through mid exams for 30 marks in the laboratory.

End semester exams are based on theory for 70 marks.

Assessment Procedure: Laboratory

1. Every lab session (100 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30students.
2. The teachers are to assess each learner in a lab session for not less than 10 speaking activities.
3. As part of practice sessions of the whole semester in the lab, a minimum of 20 speaking activities should be conducted and each one is to be assessed for 10 marks or 10%. The average of any 10 activities'marks are scaled down to 10 in mid I and other 10 in mid
4. An Internal test is conducted for 10 marks.

S.No	Activity	Schedule	Evaluation	Final Marks
1	Spoken-1	After I Cycle	Each activity @ 1 Mark	10 Marks
2	Spoken-2	After II Cycle	Each activity @1 Mark	10 Marks
3	Spoken	Lab Internal	One activity @ 10 Marks	10 Marks

The rubric given below has to be filled in for all the students for all activities.

Body language (Gestures & Postures) (Eye Contact)	Fluency & Audibility	Clarity in Speech	Neutralization of accent	Appropriate Language (Grammar Accuracy & appropriate Vocabulary)	Total 10 marks	Remarks

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	2	-	-	2	-	-	-	2	2	-	-	-	3
CO2	2	-	-	-	-	2	2	-	2	2	-	-	-	3
CO3	2	-	-	-	-	2	-	2	2	2	-	2	-	3
CO4	2	-	-	-	2	-	-	-	-	2	-	2	-	3
CO5	2	-	-	-	-	2	-	-	-	2	-	2	-	3
CO*	2	2	-	-	2	2	2	2	2	2	-	2	-	3

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - I Semester

S. No.	Course code	Course Title	L	T	P	Credits
2	R20BSH-MA1101	Numerical Method and Ordinary Differential Equations	3	0	0	3

Course Objectives:

- To familiarize the numerical techniques for solving non-linear equations, interpolation, differentiation, integration and ordinary differential equations.
- To enlighten the learners in the concept of ordinary differential equations.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

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

1. Apply numerical methods and implement interpolation techniques to solve real-world problems in engineering. (L3)
2. Apply numerical methods to solve ordinary differential equations that arise in various engineering fields. (L3)
3. Apply the first order ordinary differential equations to solve various engineering problems. (L3)
4. Apply the higher order ordinary differential equations to solve various engineering problems. (L3)
5. Apply the Laplace transform to solve differential equations and integral equations that arise in various engineering fields. (L3)

Unit I

Solution of Algebraic and Transcendental Equations: Bisection method, Regula - Falsi method, Iterative Method, Newton- Raphson method for one variable.Gauss Seidel method.

Interpolation: Finite differences, symbolic relations, Newton's forward and backward formulae, Gauss central difference formulae, Lagrange's difference formula.

Unit II

Numerical Differentiation & Integration: Derivatives using forward & backward difference formulae, Trapezoidal rule and Simpson's 1/3rd and 3/8th rules.

Solutions of Ordinary differential equations:

Taylor's series method, Picard's method, Euler's and modified Euler's methods and Runge-Kutta method of fourth order.

Unit III

Differential Equations of first Order and First Degree: Linear, Bernouill's, exact differential equations and IF Methods.

Application: Newton's Law of cooling, orthogonal trajectories, simple electrical circuits.

Unit IV

Linear Differential Equations of Higher Order: Complementary function, Particular

integral (RHS e^{ax} , Sin ax, cosax, polynomial in x, e^{ax} V(x), xV(x)), Method of variation of parameters, simultaneous linear equations with constant coefficients.

Applications: L-C-R circuits.

Unit V

Laplace transforms(All Theorems without proofs): Definition, existence conditions, properties,Laplace transforms of derivatives and integrals, multiplication by t^n, division by t, periodic functions, unit step function and impulse function. Inverse Laplace transforms and convolution theorem.

Applications: improper integrals, ordinary differential equations and integral equations.

Textbooks

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44/e, 2017.
2. B.S. Grewal, Numerical Methods in Engineering & Science, Khanna Publishers, 2014.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
5. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
6. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
7. Sastry, S.S, Introductory Methods of Numerical Analysis, 5th edition, , Prentice Hall , 2017.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO2	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO3	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO4	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO5	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO*	3	3	1	1	1	-	-	-	2	2	-	1	-	2

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - I Semester

S. No.	Course code	Course Title	L	T	P	Credits
3	R20BSH-CH1102	Engineering Chemistry	3	0	0	3

Course Objectives

- To familiarize various properties and applications of polymers.
- To aware on factors influencing rate of corrosion and different methods for control of corrosion.
- To impart knowledge on the basic concepts of battery technology and to demonstrate the construction of photovoltaic cells.
- To explain the working principle and materials used in Floppy, CD and pen drive & applications of semiconductors and superconductors.
- To introduce different types of Nano materials and importance of liquid crystals.

Course Outcomes

1. Distinguish thermoplastics and thermosetting plastics. (L2)
2. Design the metallic materials to prevent the corrosion.(L3)
3. Discuss the working principle and applications of primary, secondary battery cells, fuel cells and Photo Voltaic Cell.(L2)
4. Compare the working principle and materials used in Floppy, CD and pen drive & explain the applications of semiconductors and superconductors.(L2)
5. Illustrate the preparation, properties and applications of Nano materials and importance of liquid crystals.(L2)

UNIT-I

POLYMER TECHNOLOGY

Introduction to polymers, functionality of monomers, chain growth, step growth polymerization, stereo regular polymers, conducting polymers.

Plastics: Thermoplastics and Thermosetting, compounding of plastics, fabrication methods-compression molding, injection molding and extrusion molding, preparation, properties and applications of Urea-Formaldehyde, Bakelite, Nylon-66.

Applications:

- Polymers are used in making the body parts of electronic gadgets.

UNIT-II

CORROSION TECHNOLOGY

Introduction-corrosion definition, theories of corrosion- dry corrosion and wet corrosion-mechanism of wet corrosion by Oxygen absorption and Hydrogen evolution methods, factors affecting rate of corrosion- nature of the metal and nature of the environment, types of electro chemical corrosion-galvanic cell corrosion, differential aeration corrosion-water line corrosion, pitting corrosion, control of corrosion-cathodic protection-sacrificial anodic and impressed current cathodic protection.

Applications:

- To control corrosion of various machines used in large scale industries.

UNIT-III

ENERGY SOURCES AND APPLICATIONS

Electrochemical Energy: classification of batteries, dry cell, lead acid cell, Lithium cells-Li MnO_2 cell, Lithium ion battery, Fuel cells-Hydrogen and oxygen fuel cell, Methanol and oxygen fuel cell.

Solar Energy: Introduction-Thermal conversion-solar water heater, parabolic dish and parabolic trough, solar Tower, solar power plant-construction and working, pphoto voltaic conversion- construction and working of photo voltaic cell, applications of solar energy.

Applications:

- The lead acid battery is used in lightning and ignition system of automobiles.
- PV cells are used in electrical goods such as cookers, calculators, toys.

UNIT-IV

SUPERCONDUCTORS, SEMICONDUCTORS AND STORAGE DEVICES

Superconductivity: Types, preparation, properties and engineering applications.

Semiconductors: Introduction-purification of semi conductors-Zone refining, preparation of single crystal semi conductors- Czochralski process, stiochiometric, Non-stichometric and organic semiconductors-applications.

Storage Devices: Materials used in storage devices, working of floppy, CD and pen drive.

Applications:

- Super conductors are used in Maglev trains
- Semi conductors are used in electronic circuit devices
- Floppy, CD and pen drive are used to store large data.

UNIT-V

NANOMATERIALS AND LIQUID CRYSTALS

Nanomaterials: Introduction, preparation of nanomaterials-sol-gel method, characterization by scanning electron microscopy (SEM), Types of nanomaterials-Carbon Nano Tubes (CNT's) and Fullerenes, preparation, properties and applications of CNTs and Fullerene, applications of nanomaterials.

Liquid crystals: Introduction- types- applications.

Applications:

- Nano materials are used in paints, lubricants and medicine technology.
- Liquid crystals are used to make displays of computers, laptops, mobile phones and TV's.

Learning outcomes:

At the end of this unit, the students will be able to

- Explain the synthesis and applications of nano materials. (L-2)
- Explain the importance of liquid crystals. (L-2)

Text Books

1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, Delhi (2014).
2. B.K. Sharma, Engineering Chemistry, Krishna Prakashan, Meerut.

3. O G Palanna, Engineering Chemistry, Tata McGraw Hill Education Private Limited, (2009).

Reference Text Books

1. Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003).
2. B.S Murthy and P. Shankar, A Text Book of Nano Science and NanoTechnology, University Press (2013).
3. S.S. Dara, A Textbook of Engineering Chemistry, S.Chand & Co, (2010).
4. N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014).
5. K. Sesha Maheshwaramma and Mridula Chugh, Engineering Chemistry, Pearson India Edn services, (2016).

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	1	-	-	-	-	-	-	-	-	1	-	-
CO2	2	1	1	1	-	-	-	-	-	-	-	1	-	-
CO3	2	1	-	-	-	-	1	-	-	-	-	1	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO*	2	1	1	1	-	-	1	-	-	-	-	1	-	1

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - I Semester

S. No.	Course code	Course Title	L	T	P	Credits
4	R20CSS-ES1101	Computer Programming in C	3	0	0	3

Course Objectives:

The objectives of this course is to acquire knowledge on the

- To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.
- To enable effective usage of Control Structures and Implement different operations on arrays.
- To demonstrate the use of Strings and Functions.
- To impart the knowledge of pointers and understand the principles of dynamic memory allocation.
- To understand structures and unions
- To impart the Knowledge Searching and Sorting Techniques.

Course Outcomes:

At the end of the Course, Student should be able to:

1. Develop Algorithms and flowcharts and also Understand the compilation, debugging , execution and writing of basic C programs.(L3)
2. Develop C Programs using control and iterative statements. (L3)
3. Develop C programs using Arrays and pointers (L3)
4. Apply the knowledge of strings and functions in programming(L3)
5. Comprehend structures and unions (L3)

UNIT-I

Introduction to Computers ,Algorithm and Flowchart design :

Introduction-Computer Hardware, Bits and Bytes, Components, types of languages.

Algorithm- Definition , Characteristics, Steps to develop ,examples**.**

Flow chart-Definition, symbols, Input/Output, Assignment, conditional if, repetition, function and sub charts. Example problems.

UNIT-II

Introduction to C Programming: Introduction, Structure of a C Program. Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements. Operators, Type Conversion.

Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else—if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

UNIT-III

Arrays: Introduction, Operations on Arrays, Arrays as Function Arguments, Two dimensional Arrays, Multi dimensional arrays.

Pointers: Cconcept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function

Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments,

UNIT-IV

Functions: Introduction, Function Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes. Recursion.

Strings: String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

UNIT-V

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type — Enum variables, Using Typedef keyword, Bit Fields.

Text Books

1. How to solve it by Computer, R. G. Dromey, and Pearson Education.
2. Computer Programming. Reema Thareja, Oxford University Press
3. Let us C , Yaswanth Kanetkar, 16th Edition,BPB Publication.

Reference Books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. Programming In C A-Practia1 Approach. Ajay Mittal, Pearson.
3. C Programming — A Problem Solving Approach, Forouzan, Gilberg, Cengage.
4. The C Programming Language, Dennis Richie And Brian Kernighan, Pearson Education.
5. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication.

Web Links:

1. http://www.c4learn.com/
2. http://www.geeksforgeeks.org/c/
3. http://nptel.ac.in/courses/122104019/
4. http://www.learn-c.org/
5. https://www.tutorialsyoint.com/cprogramming/

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	2	-	1	2	-	3
CO2	3	3	3	2	-	-	-	-	-	-	1	3	-	-
CO3	3	3	3	2	-	-	-	-	2	-	1	3	-	-
CO4	3	3	3	2	-	-	-	-	-	-	1	3	-	-
CO5	3	3	3	2	-	-	-	-	-	-	1	3	2	-
CO*	3	3	3	2	2	-	-	-	2	-	1	3	2	3

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - I Semester

S. No.	Course code	Course Title	L	T	P	Credits
5	R20MEC-ES1101	Engineering Drawing	1	0	4	3

Course Objectives:

- To enhance the communications of the students using engineering drawing.
- To make the student familiar to the drawing practices and convection.
- To familiarize the techniques of constructing polygons curves.
- To introduce the orthographic projections, projections of points, lines and planes.
- To make the students understand as to how the industry communicates technical information.
- To enable the student draft simple engineering components and analyze different views of components.

Course Outcomes:

After the completion of this course, the student can able to

1. Apply the basics of engineering drawing to construct the polygons, curves and orthographic projections of points. (L3)
2. Depict the orthographic projections of straight lines in various orientations relative to reference planes. (L3)
3. Draw the projections of regular planes in various orientations relative to the reference planes. (L3)
4. Construct the projections of various solids, including polyhedral and solids of revolution, in different orientations relative to the reference planes. (L3)
5. Convert isometric views into orthographic views, and vice versa.(L3)

Unit I

Introduction to Engineering drawing: Principles of Engineering drawing and their significance-Conventions in drawing-lettering - BIS conventions, types of lines and methods of dimensioning.

Polygons: - Construction of regular polygons using given length of a side;

Ellipse: - Arcs of circles and Oblong methods.

Projections: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants.

Applications:

- Elliptical shape - bridges and arches, elliptical trammel.

Unit II

Orthographic projections of straight lines, lines parallel either two of the reference planes (HP,VP or PP)

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination .

Applications:

- Structural plans and elevations.
- Stair casing designs, Structural plans and elevations.

Unit III

Projections of Planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

Applications: Structural plans and elevations, stair casing designs.

Unit IV

Projections of Solids: Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

Applications: Machine component drawings, AC ducts, cooling towers , piping layout designs,

Unit V

Isometric Views And Orthographic Views:

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Applications : Structural drawings –industrial components, architectural drawing.

Text Books

1. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.
2. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.
3. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.

Reference Books

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	1	2	-	-	-	-	-	-	1	1	-
CO2	3	3	2	1	2	-	-	-	-	-	-	1	1	-
CO3	3	3	2	1	2	-	-	-	-	-	-	1	1	-
CO4	3	3	2	1	2	-	-	-	-	-	-	1	1	-
CO5	3	3	2	1	2	-	-	-	-	-	-	1	1	-
CO*	3	3	2	1	2	-	-	-	-	-	-	1	1	-

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - I Semester

S. No.	Course code	Course Title	L	T	P	Credits
6	R20BSH-CH1105	Engineering Chemistry Lab	0	0	3	1.5

Course Objectives

- To familiarize the students with the basic concepts of Engineering Chemistry lab.
- To train the students on how to handle the instruments.
- To demonstrate the digital and instrumental methods of analysis.
- To expose the students in practical aspects of the theoretical concepts.

Course Outcomes

1. Explain the functioning of the instruments such as Conductivity and pH meters.(L2)
2. Interpret the graphical values to analyze the experimental results.(L2)
3. Determine the concentrations of Acid, Zinc and Copper.(L3)
4. Prepare polymers and nano-materials.(L2)
5. Identify the safety precautions to carry out the experiments in the laboratory using chemicals.(L3)

List of Experiments

1. Preparation of Phenol-Formaldehyde resin
2. Preparation of Urea-Formaldehyde resin
3. Determination of Zinc by EDTA method.
4. Determination of Copper in a copper ore
5. Determination of Corrosion of a metal in the presence/absence of inhibitors
6. Determination of Sulphuric acid in lead-acid storage cell
7. Determination of Hardness of a ground water sample.
8. Determination of strength of an acid by Conductometric method/pH metric method

Virtual Labs

9. Chemical Etching of Printed Circuit Boards(PCB)
10. Preparation of nano particles using sol-gel method.

Text Books

1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	-	-	-	-	-	-	2	-	1	1	-	-
CO2	2	1	-	1	-	-	-	-	2	-	-	1	-	-
CO3	2	1	1	-	-	-	-	-	2	-	-	1	-	-
CO4	2	1	-	-	-	1	1	-	2	-	-	1	-	-
CO5	2	1	-	-	-	-	-	-	2	-	-	1	-	-
CO*	2	1	1	1	-	1	1	-	2	-	1	1	-	-

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - I Semester

S. No.	Course code	Course Title	L	T	P	Credits
7	R20CSS-ES1103	Computer Programming in C Lab	0	0	3	1.5

Course Objectives:

The objectives of this course is to acquire knowledge on the

- To impart knowledge on basic Linux commands, various Editors, Raptor.
- To make the students understand the concepts of C programming.
- To nurture the students on Control Structures and develop different operations on arrays.
- To make use of String fundamentals and modular programming constructs.
- To implement programs using dynamic memory allocation.
- To explain the concepts of Structure and Unions.

Course Outcomes:

1. Learn Basic computer Installations and Office Tools, Document and present the algorithms, flowcharts and programs in form of user-manual and also apply and practice logical ability to solve the problems. (L2)
2. Understand C programming development environment and also how to compiling, debugging, and linking a Program using C Language.(L2)
3. Apply arrays, strings concepts to solve problems. (L3)
4. Understand and apply the in-built functions and customized functions for solving the problems.(L2)
5. Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.(L2)

List of Experiments:

1. Introduction to Algorithms and Flowcharts

1.1) Implement Algorithm Development for Exchange the values of Two numbers.

1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.

1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultant sum. Assume N is greater than or equal to zero.

2. Introduction to C Programming

2.1) Basic Linux Commands.

2.2) Exposure to Turbo C, Vi, Emacs, Code Blocks IDE, Dev C++.

2.3) Writing simple programs using printf(), scanf() .

3. Raptor

3.1) Installation and Introduction to Raptor.

3.2) Draw a flow chart to find the Sum of 2 numbers.

3.3) Draw a flow chart to find Simple interest.

4. **Basic Math**
   - 4.1) Write a C Program to convert Celsius to Fahrenheit and vice versa.
   - 4.2) Write a C Program to find largest of three numbers using ternary operator.
   - 4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.
5. **Control Flow- I**
   - 5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.
   - 5.2) Write a C program to find the roots of a Quadratic Equation.
   - 5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide UsingSwitch...case.
6. **Control Flow- II**
   - 6.1) Write a C Program to Find Whether the Given Number is Prime number or not.
   - 6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.
   - 6.3) Write a C program to print Floyd Triangle.
7. **Control Flow- III**
   - 7.1) Write a C program to find the sum of individual digits of a positive integer.
   - 7.2) Write a C program to check whether given number is palindrome or not.
   - 7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometric progression $1+x+x'+x^3+\ldots\ldots\ldots\ldots+x^n$.
8. **Arrays**
   - 8.1) Write a C program to search an element in the given array (Linear Search).
   - 8.2) Write a C program to perform matrix addition.
   - 8.3) Write a C program to perform matrix multiplication.
9. **Pointers**
   - 9.1) Write a C Program to Perform Addition. Subtraction, Multiplication and Division of two numbers using Command line arguments.
   - 9.2) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
   - 9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.
10. **Functions, Array & Pointers**
    - 10.1) Write a C Program to demonstrate parameter passing in Functions.
    - 10.2) Write a C Program to find Fibonacci. Factorial of a number with recursion and without recursion.
    - 10.3) Write a C Program to find the sum of given numbers with arrays and pointers.
11. **Strings**
    - 11.1) Implementation of string manipulation operations with library function: Copy, concatenate, length, compare
    - 11.2) Implementation of string manipulation operations without library function: Copy, concatenate, length, compare
12. **Structures**
    - 12.1) Write a C Program to Store Information of a book Using Structure.
    - 12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

Note: Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.

Text Books

1. Let us C , Yaswanth Kanetkar, 16th Edition,BPB Publication.
2. How to solve it by Computer, R. G. Dromey, and Pearson Education.
3. Computer Programming. Reema Thareja, Oxford University Press

Reference Books

1. Programming in C A-Practical Approach Ajay Mittal. Pearson Education.
2. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
3. Problem solving using C , K Venugopal,3'd Edition,TMG Publication.

Web Links:

1. https://www.hackerrank.com/
2. https://www.codechef.com/
3. https://www.topcoder.com/
4. https://code-cracker.github.io/
5. https://raptor.martincar1is1e.com/
6. httos://npte1.ac.in/courses/106105055/2

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	-	-	-	-	-	-	-	-	2	3
CO2	3	3	3	2	-	-	-	-	-	-	-	-	2	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	2	3
CO4	3	3	3	2	-	-	-	-	-	-	-	2	2	3
CO5	3	3	3	2	-	-	-	-	2	-	-	2	2	3
CO*	3	3	3	2	-	-	-	-	2	-	-	2	2	3

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - I Semester

S. No.	Course code	Course Title	L	T	P	Credits
8	R20EEE-ES1104	Electrical Engineering Workshop	0	0	3	1.5

Course Objectives:

- To demonstrate the usage of measuring equipment
- To identify different protective equipment's and their usage.
- To train the students in setting up simple wiring circuits
- To impart methods in electrical machine wiring
- To explain the starting methods of dc motors
- To explain the starting methods of single phase and three phase induction motors.

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

1. Explain the limitations, tolerances, Safety aspects of electrical systems and wiring.(L2)
2. Select wires/cables and other accessories used in different types of wiring.(L1)
3. Make simple lighting and power circuits.(L3)
4. Measure current, voltage and power in a circuit.(L2)
5. Apply starting methods to AC and DC Machines. (L3)

List of Experiments

1. Study of various electrical tools and symbols.
2. Identify different types of cables/wires and switches, fuses & fuse carriers, MCB and ELCB, MCCB with ratings and usage.
3. Wiring of light /fan circuit using two way/three way control (stair case wiring) Go-down wiring/Tunnel wiring.
4. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy meter.
5. Measurement of voltage, current, resistance in DC circuit.
6. Measurement of voltage, current and power in single phase circuit using voltmeter, ammeter and wattmeter. Calculate the power factor of the circuit.
7. Wiring of backup power supply including inverter, battery and load for domestic Installations.
8. Starting of DC shunt motor using three point starter
9. Starting of DC series motor using two point starter
10. Starting of single phase induction motor
11. Starting of three phase induction motor.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	2	-	-	-	-	-	2	-	-	2	1	1
CO2	2	1	2	-	-	-	-	-	2	-	-	2	1	1
CO3	2	1	2	-	-	-	-	-	2	-	-	2	1	1
CO4	2	1	2	-	-	-	-	-	2	-	-	2	1	1
CO5	2	1	2	-	-	-	-	-	2	-	-	2	1	1
CO*	2	1	2	-	-	-	-	-	2	-	-	2	1	1

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - II Semester

S. No.	Course code	Course Title	L	T	P	Credits
1	R20BSH-MA1201	Linear Algebra and Multivariable Calculus	3	0	0	3

Course Objectives:

- This course is designed to equip the students with the necessary Mathematical skills and techniques that are essential for an engineering course.
- To enlighten the learners in the concept of Linear Algebra.
- To enlighten the learners in the concept of Multivariable Calculus.

Course Outcomes:

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

1. Apply the matrix algebra techniques to engineering applications.(L3)
2. Apply the concepts of Eigen values and Eigen vectors to free vibration of a two mass system. (L3)
3. Apply partial differentiation to find maxima and minima of functions of several variables (L3)
4. Evaluate the volume and surface area of solids using multiple integrals. (L2)
5. Apply vector differential operators to find potential functions and estimate the work done against a field, circulation and flux using vector integral theorems(L3)

Unit I

Systems of Linear Equations: Rank, echelon form and normal form of a matrix, PAQ form. homogeneous and non-homogeneous linear equations, Gauss elimination method, Gauss Jordan method.

Application: Finding the current in an electrical circuit.

Unit II

Eigen values, Eigen vectors and Quadratic forms: Eigen values and Eigen vectors, properties (without proofs), diagonalisation, Cayley-Hamilton theorem (without proof), Quadratic forms, reduction to canonical form by orthogonal and linear transformation, rank, index, signature and nature of the quadratic forms.

Application: Free vibration of two mass systems.

Unit III

Partial Differentiation: Partial derivatives, total derivative, chain rule, Taylor's series and Maclaurin's series of functions of two variables, change of variables, Jacobian, functional dependence.

Applications: Tangent planes and Normal lines, Maxima and Minima of functions with and without constraints, method of Lagrange's multipliers.

Unit IV

Multiple Integrals: Double integrals, change of variables, change of order of integration, triple integrals, change of variables to spherical polar co-ordinates.
Applications: Area enclosed by plane curves.

Unit V

Vector Calculus (All Theorems without proofs): Scalar and vector point functions, vector operator del, Gradient, Divergence and Curl and vector identities. Line, surface and volume integrals, Green's, Stoke's and Divergence theorems.
Application: Potential surfaces, Work done, flux.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References:

2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
3. James Stewart, Calculus, 7th Edition, Brooks/Cole Cengage Learning (Chapter 14).
4. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
5. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
6. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
7. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
8. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO2	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO3	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO4	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO5	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO*	3	3	1	1	1	-	-	-	2	2	-	1	-	2

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - II Semester

S. No.	Course code	Course Title	L	T	P	Credits
2	R20BSH-MA1203	Mathematical Techniques	3	0	0	3

Course Objectives:

- To familiarize the learners with transform techniques.
- To enlighten the learners in the concept of partial differential equations.

Course Outcomes:

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

1. Apply mean value theorems to real world problems.(L3)
2. Apply Z-transforms to solve various engineering problems(L3)
3. Apply Fourier series to practical harmonic Analysis(L3)
4. Evaluate Fourier transform of a function. (L2)
5. Apply the partial differential equations to solve various engineering problems. (L3)

Unit I

Mean Value Theorems: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders.

Infinite Series (without proofs):: Infinite series, convergence and divergence of series, geometric series, auxiliary series, comparison tests, ratio test, Cauchy's root test, Raabe's test, alternating series, Leibnitz test, absolute and conditional convergence.

Unit **II**

Z-transforms: Definition of Z-transform, elementary properties, linearity property, damping rule, shifting u_n to the right and left, multiplication by n, initial value theorem, final value theorem, inverse Z-transform, convolution theorem.

Applications: Solution of difference equations using Z-transforms.

Unit III

Fourier Series: Fourier series, Dirichlet's conditions, even and odd functions, Fourier series of functions in an arbitrary interval, Half-range series, Parseval's Identities.

Applications: Practical Harmonic Analysis.

Unit IV

Fourier transforms: Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform, properties. Inverse Fourier transforms, Finite Fourier transforms.

Unit V

Partial Differential Equations (PDE): First order partial differential equations, solutions of first order linear and standard forms of non-linear PDE, Method of separation of variables.

Applications: 1D Wave equation.

Text Books

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
5. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
6. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
7. James Stewart, Calculus, 7th Edition, Brooks/Cole Cengage Learning (Chapter 14).
8. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO2	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO3	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO4	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO5	3	3	1	1	1	-	-	-	2	2	-	1	-	2
CO*	3	3	1	1	1	-	-	-	2	2	-	1	-	2

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - II Semester

S. No.	Course code	Course Title	L	T	P	Credits
3	R20BSH-PH1202	Applied Physics	3	0	0	3

Course objectives:

- To impart knowledge in basic concepts of Wave optics, Lasers and Fiber optics, semiconductor physics and digital electronics
- To familiarize the applications of Wave optics, Lasers and Fiber optics, semiconductor physics and digital electronics

Course Outcome:

After the completion of this course the student can able to

1. Interpret the interaction of optic energy with matter on the basis of interference (L2)
2. Apply the principles of diffraction to the electrical and electronics engineering systems (L2)
3. Enumerate the properties of polarization & Lasers and (L2)
4. Describe the fundamentals of Fiber Optics &semiconductors (L2)
5. Analyze the problems of digital electronics to electrical and electronics engineering systems (L2)

Unit I

Interference: Principle of superposition of waves- interference of light- Conditions for sustained interference- interference in thin films by Reflection-Newton's Rings-Determination of wavelength; **Applications:** Interference Filters and Testing of flatness of the surfaces

Unit II

Diffraction: Introduction- comparison of interference and diffraction-Types of diffractions of light-Fraunhofer diffraction due to single slit, Fraunhofer diffraction due to double slit, Fraunhofer diffraction due to N-parallel slits, Diffraction Grating-Grating Spectrum-Determination of wavelength, Rayleigh's criterion; **Applications:** Resolving power of Grating

Unit III

Polarization and Lasers

Polarization: Polarization by reflection, refraction and double refraction-Nicol Prism-Half Wave and Quarter Wave Plate. **Applications**: Glare reduction due to sunglasses

Lasers: Characteristics- Spontaneous and Stimulated Emissions- Pumping and Population Inversion-Ruby Laser-He-Ne-Laser; **Applications:** Medical applications and communication applications

Unit IV

Fiber Optics and Semiconductor Physics

Fiber Optics: Introduction to optical Fibers-Total Internal Reflection-Critical Angle of Propagation-Acceptance Angle-Numerical Aperture-**Applications:** Fiber Optical communication, Medical Applications-Fiber Optic Sensors

Semiconductor Physics Origin of Energy Bands- Classification of Solids based on Energy

Bands- intrinsic and extrinsic (P-N) semiconductors- Fermi Energy- Direct and Indirect Band Gap Semiconductors- Hall Effect-Hall coefficient; **Applications:** LED

Unit-V

Digital Electronics: Introduction to digital Electronics- decimal number system-binary number system- digital-binary conversion & vice–versa-Binary arithmetic- Demorgan's Theorem-Logic Gates-Basic Gates-Universal gates; **Applications:** Realization of other gates using universal gates

Text Books

1. M.N.Avadhanulu,P.G.Kshrisagar "A Text book of Engineering Physics" –S.Chand Publications, 2017
2. 2.H.K. Malik &A.K. Singh "Engineering Physics", - McGraw Hill Publishing Company Ltd, 2018
3. Ch. Srinivas, Ch. SeshuBabu, "Engineering Physics", Cengage Learning

Reference Books

1. Gerd Keiser "Optical Fiber Communications"-4/e, Tata Mc GrawHill, 2008
2. S.M. Sze "Semiconductor Devices-Physics and Technology" –Wiley, 2008
2. Sanjay D Jain, Girish G Shastra Buddi, "Engineering Physics" –University Press
3. Fundamentals of digital Electronics. A. Anand Kumar. PHI (Prentice Hall India)

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	3	1	1	-	1	1	-	-	-	-	-	1	1	-
CO4	3	1	1	-	-	1	-	-	-	-	-	1	1	-
CO5	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO*	3	1	1	-	1	1	-	-	-	-	-	1	1	-

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - II Semester

S. No.	Course code	Course Title	L	T	P	Credits
4	R20EEE-ES1203	Electrical Circuit Analysis – 1	3	0	0	3

Course Objectives:

- To study the concepts of passive elements, types of sources and various network reduction techniques.
- To understand the applications of network topology to electrical circuits.
- To understand the difference between electric and magnetic circuit.
- To study the behavior of RLC networks for sinusoidal excitations.
- To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
- To study the applications of network theorems for analysis of electrical networks.

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

1. Understands V-I relationships of basic circuit elements and network reduction techniques. (L2)
2. Determine of co-efficient of coupling for a given magnetic circuit. (L2)
3. Analyses single phase ac circuits and understands concepts of phase and power factor.(L4)
4. Extends knowledge of dc analysis to ac circuits and determines selectivity of a RLC resonant circuit.(L2)
5. Simplify complex electrical networks by using various network theorems.(L3)

UNIT-I

Introduction to Electrical Circuits &Network topology: Passive components and their V-I relations. Sources (dependent and independent) -Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation). Source transformation technique, nodal analysis and mesh analysis.

Network topology:Definitions of Graph and Tree, Basic cut-set and tie-set matrices for planar networks, Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources, Duality and Dual networks.

UNIT-II

Magnetic Circuit: Basic definition of MMF, flux and reluctance. Analogy between electrical and magnetic circuits. Faraday's laws of electromagnetic induction Concept of self and mutual inductance. Dot convention-coefficient of coupling and composite magnetic circuit. Analysis of series and parallel magnetic circuits.

UNIT-III

Single Phase A.C Systems: Periodic waveforms (determination of rms, average value and form factor).Concept of phase angle and phase difference – Waveforms and phasor diagrams for lagging, leading networks. Complex and polar forms of representations, steady state analysis of R, L and C circuits. Power Factor and its significance real, reactive power and apparent power, waveform of instantaneous power triangle and complex power

UNIT-IV

Analysis of AC Networks

Extension of node and mesh analysis to AC networks, Numerical problems on sinusoidal steady state analysis, Series and parallel resonance, Selectively band width and Quasi factor, Introduction to locus diagram.

UNIT-V

Network theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

Text Books

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, Mc Graw Hill Company, 6th edition.
2. Network synthesis: Van Valkenburg; Prentice-Hall of India Private Ltd.

Reference Books

1. Introduction to circuit analysis and design by Tildon Glisson. Jr, Springer Publications.
2. Circuits by A.Bruce Carlson , Cengage Learning Publications.
3. Network Theory Analysis and Synthesis by Smarajit Ghosh, PHI publications.
4. Networks and Systems by D. Roy Choudhury, New Age International publishers.
5. Electric Circuits by David A. Bell, Oxford publications.
6. Circuit Theory (Analysis and Synthesis) by A.chakrabarthi, Dhanpat Rai&co.

Web Links

1. https://nptel.ac.in/courses/108/105/108105159/
2. https://nptel.ac.in/courses/108/106/108106172/
3. https://nptel.ac.in/courses/108/104/108104139/
4. https://nptel.ac.in/courses/108/105/108105112/

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO2	2	2	2	2	-	-	-	-	-	-	-	3	2	2
CO3	3	3	2	2	-	-	-	-	-	-	-	3	2	2
CO4	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO5	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO*	2	2	2	2	-	-	-	-	-	-	-	2	2	2

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - II Semester

S. No.	Course code	Course Title	L	T	P	Credits
5	R20MEC-ES1204	Thermal and Hydro Prime Movers	3	0	0	3

Course Objectives:

- To give an overview of Internal Combustion Engines, their classification, applications, operation and processes & IC engines and the fuel supply systems & ignition systems, cooling systems and lubrication systems and measure the performance parameters on spark ignition and compression ignition engines.
- Develop the concept on Rankine's cycle and its thermal efficiency improvement & Give an idea on steam turbines & Evaluate the performance turbines.
- Understand gas turbine fundamentals and the methods to improvethe efficiency of gas turbines to know the different kinds of powerplants
- To study the Hydrodynamic force of jets on stationery and moving blades & to study about centrifugal Pumps, types and working principles.
- To study the classification of Hydraulic turbines and work done and efficiency of the different turbines and specific speed and performance characteristics of different types of turbines. Also, To study about hydroelectric power plant and estimation of hydropower potential.

Course Outcomes:

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

1. Classify internal combustion engine and Evaluate the performance of IC engines.(L2)
2. Estimate the performance of a steam turbine using vapor power cycles and velocity diagrams. (L2)
3. Apply thermodynamic principles to analyze gas turbine efficiency and performance.(L3)
4. Apply the concepts of momentum equation for finding the forces acting on the vanes of the turbines, centrifugal pump. (L3)
5. Calculate the performance characteristics of a Hydraulic turbine at different loads. (L2)

Unit I

Objectives: To make the student learn about the constructional features, operational details of various types of internal combustion engines through the details of several engine systems and Further, the student shall be able to calculate the performance of different types of internal combustion engines.

I.C. Engines: Classification, working principles – valve and port timing diagrams – Engine systems line fuel injection, carburetion, ignition, cooling and lubrication – Engine performance evaluation.

Application: Automobile vehicles

Unit II

Objectives: To make the student correlate between the Carnot and Rankine cycle that govern the steam turbines. To train the student to calculate the performance of steam turbines using velocity diagrams.

Vapor Power Cycles: Benefits of Rankine cycle over Carnot cycle, specific steam

consumption, Rankine Cycle- Efficiency and output of Rankine Cycle-Re-generative cycle Steam.

Steam Turbines: Schematic layout of steam power plant Classification of Steam Turbines, Impulse Turbine and Reaction Turbine - Velocity Diagrams for simple Impulse and Reaction Turbines- Work done &efficiency
Application: Steam power plants.

Unit III

Objectives: To impart the knowledge of gas turbine fundamentals, the governing cycles and the methods to improve the efficiency of gas turbines.
Gas Turbines: Simple gas turbine plant-ideal cycle, closed cycle -open cycle-. Efficiency, Work ratio and optimum pressure ratio for simple gas turbine cycle. Analysis of simple cycles & cycles with inter cooling, reheating and Regeneration
Application: Gas turbine power plants

Unit IV

Objectives: To teach the student about the fundamental of fluid dynamic equations and its applications fluid jets. To impart the knowledge of various types of pumps, their constructional features, working and performance.
Impact of Jets and Pumps: Impulse momentum equation, Impact of Jet on stationary and moving vanes (flat and curved).
Pumps: Types of pumps, Centrifugal pumps: Main components, Working principle, Multi stage pumps.
Application: Bore wells, Water servicing for automobile vehicles, Industries etc.

Unit V

Objectives: To make the student learn about the constructional features, operational details of various types of hydraulic turbines. Further, the student shall be able to calculate the performance of hydraulic turbines.
Hydraulic Turbines: Classification of turbines; Working principle of Pelton wheel, Francis and Kaplan turbines, Efficiency, Performance and characteristic curve.
Hydro Electric Power: Components of Hydroelectric power plant: pumped storage systems, Estimation of water power potential; Estimation of load on turbines: load curve, load factor, capacity factor, utilization factor, diversity factor
Application: hydraulic turbine power plant, Dams, Industries etc.

Text Books

1. Thermal Engineering by RKRajput, S. Chand Publications.
2. A Text of Fluid Mechanics and Hydraulic Machines by Dr. R.K.Bansal, Laxmi Publications.

References

1. Thermal Engineering by M.L.Mathur&F.S.Mehta, Jain Brothers Publications.
2. Thermal Engineering P.L.Ballaney, KhannaPublications.
3. Internal Combustion Engines by V Ganesan

4. A Text Book of Fluid Mechanics and Hydraulic Machines by RK Rajput, S. Chand Publications.
5. Hydraulics and Fluid Mechanics including Hydraulic Machines by P.N.MODI& S.M SETH

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	-	-	-	-	-	-	-	-	2	-	2
CO2	2	2	-	-	-	-	-	-	-	-	-	2	-	2
CO3	3	2	3	-	-	-	-	-	-	-	-	2	-	2
CO4	2	2	-	-	-	-	-	-	-	-	-	2	-	2
CO5	3	2	3	-	-	-	-	-	-	-	-	2	-	2
CO*	3	2	3	-	-	-	-	-	-	-	-	2	-	2

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - II Semester

S. No.	Course code	Course Title	L	T	P	Credits
6	R20BSH-EN1201	Communicative English Lab	0	0	3	1.5

Course Objectives

- Adopt activity based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions.
- Facilitate active listening to enable inferential learning through expert lectures and talks
- Impart critical reading strategies for comprehension of complex texts
- Provide training and opportunities to develop fluency in English through participation in formal group discussions and presentations using audio-visual aids
- Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal correspondence
- Encourage use of a wide range of grammatical structures and vocabulary in speech and writing

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

1. Acquire Listening skills for answering questions, make formal presentations without graphical elements, prioritize information from reading texts, paraphrase short academic texts and get awareness about plagiarized content and academic ethics.(L2)
2. Comprehend academic lectures by taking notes, make formal presentations on academic topics using PPT slides with relevant graphical elements ,distinguish facts from opinions while reading ,write formal letters and emails and use a range of vocabulary in formal speech and writing.(L3)
3. Participate in group discussions using appropriate language strategies, comprehend complex texts, produce logically coherent argumentative essays and use appropriate vocabulary to express ideas and opinions. (L2)
4. Draw inferences and conclusions using prior knowledge and verbal cues, express thoughts and ideas accurately and fluently, develop advanced reading skills for a deeper understanding of texts, prepare a CV with a cover letter to seek internship/ job, and understand the use of passive voice in academic writing.(L2)
5. Develop advanced listening skills for in-depth understanding of academic texts, make presentations collaboratively, understand the structure of Project Reports and use grammatically correct structures with a wide range of vocabulary. (L3)

Unit 1

Listening: Listening for presentation strategies and answering questions on the speaker, the audience, and key points. **Speaking:** Formal presentations using PPT slides without graphic elements. **Reading:** Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize the academic style. **Writing:** Paraphrasing; using quotations in writing; using academic style - avoiding colloquial words and phrases. **Grammar and Vocabulary:** Formal/academic words and phrases.

Unit 2

Listening: Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse. **Speaking:** Formal presentations using PPT slides with graphic elements. **Reading:** Understand formal and informal styles; recognize the difference between facts and opinions. **Writing:** Formal letter writing and email writing (enquiry, complaints, seeking permission, seeking internship); structure, conventions and etiquette. **Grammar and Vocabulary:** Phrasal prepositions; phrasal verbs.

Unit 3

Listening: Identifying views and opinions expressed by different speakers while listening to discussions. **Speaking:** Group discussion on general topics; agreeing and disagreeing, using claims and examples/evidence for presenting views, opinions and positions. **Reading:** Identifying claims, evidence, views, opinions and stance/ position. **Writing:** Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidence. **Grammar and Vocabulary:** Language for different functions such as stating a point, expressing opinions, agreeing/ disagreeing, adding information to what someone has stated, and asking for clarification.

Unit 4

Listening: Understanding inferences; processing of information using specific context clues from the text. **Speaking:** Group discussion; reaching consensus in group work (academic context). **Reading:** Reading for inferential comprehension. **Writing:** Applying for internship/ job - Writing one's CV/Resume and cover letter. **Grammar and Vocabulary:** Active and passive voice – use of passive verbs in academic writing.

Unit 5

Listening: Understanding inferences - the processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge. **Speaking:** Formal team presentations on academic/ general topics using PPT slides. **Reading for Writing:** Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; the significance of references. **Grammar and Vocabulary:** Reinforcing learning; editing short texts; correcting common errors in grammar and usage.

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012. (Student Book, Teacher Resource Book, CD & DVD)

Sample Web Resources

Grammar/Listening/Writing

1-language.com
http://www.5minuteenglish.com/
https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online
http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/
http://www.nonstopenglish.com/
https://www.vocabulary.com/
BBC Vocabulary Games
Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/
https://www.englishclub.com/reading/short-stories.htm
https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613
http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/
BBC Learning English – Pronunciation tips
Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/
http://www.world-english.org/
http://learnenglish.britishcouncil.org/

Online Dictionaries

Cambridge dictionary online
MacMillan dictionary
Oxford learner's dictionaries

COMMUNICATIVE ENGLISH LAB-II END EXAM PATTERN

Internal Exam Pattern"

Day to Day Performance (10M)	Record (5M)	Internal Exam(10M)	Final Total (25 M)
In lab Activity Participation and day to day Assessment performance (10)	Completing the exercises in Lab Manual cum Record (5)	Written Exam (5) +Oral (5)`	25(M)

NOTE:

- 10 day to day Assessments based on five modules carry grades which can be scaled to 10 marks.
- Similarly all 2 modules Practice work is graded that can be scaled to 5 marks for the Record
- Written exam is on Listening, Reading & Writing along with Grammar & Vocabulary.
    a) **Listening:**(Note taking/inference meaning/watching Video clips & Listening to Audio Clip)5 marks
    b) **Reading Comprehension:Chapter 13 to 16 in Wings of Fire**(Multiple-Choice/Multiple cloze/right,wrong,doesn't say)-5 Marks
    c) **Writing**:Emails,/Letter writing/CV -10 Marks
    d) **Grammar & Vocabulary**:Common errors in grammar (5M) pg 108-114 from Avenues & Vocabulary **(How to talk About Personality types-pg31-57 (Session** 1-3) from Word power Made Easy (5 M)-10 Mark

Note: The written exam is for 30 marks and the final score will be scaled for 5 marks.

- Oral Examination is on (Group Discussion/Debate/Presentation Skills / Interview technique tasks from AVENUE Lab Manual)

External Exam Pattern:

- **Written test: 20 marks**.**(Listening+Reading+Writing+Grammar & Vocabulary)**
  Note: LRWGV Activities are given from Internal exam Specified Syllabi.
- **Oral Exam: 10 marks** (Debate/GD/Oral presentation) **(Speaking)**
- **Viva-Voce by the External Examiner: 20 marks**
  Note: Total marks allotted for the exam is 50

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	3	-	-	3	2	3	2	2	-	-
CO2	-	-	-	-	3	2	2	3	2	3	2	2	-	-
CO3	-	-	-	-	3	2	2	3	2	3	2	2	-	-
CO4	2	2	-	-	3	2	-	3	2	3	2	2	-	-
CO5	-	-	-	-	3	2	2	3	2	3	2	2	-	-
CO*	2	2	-	-	3	2	2	3	2	3	2	2	-	-

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - II Semester

S. No.	Course code	Course Title	L	T	P	Credits
7	R20BSH-PH1204	Applied Physics Lab	0	0	3	1.5

Course Objectives

- To impart the practical knowledge in basic concepts of Wave optics, Lasers and Fiber optics and Semiconductor physics
- To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge, spectrometers, travelling microscope, laser device, optical fibre, etc.
- To expose the students in practical aspects of the theoretical physics.

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

1. Apply the working principles of laboratory experiments in optics, electrical and electronics. (L3)
2. Compute the required parameter by suitable formula using experimental values (observed values) in optics, electrical and electronic experiments. (L2)
3. Analyze the experimental results through graphical interpretation. (L4)
4. Recognize the required precautions to carry out the experiment and handling the apparatus in the laboratory.(L2)
5. Demonstrate the working principles, procedures and applications. (L2)

List of Experiments

1. Determination of thickness of thin paper/piece of hair by wedge shaped air film.
2. Determination of the radius of curvature of the lens by Newton's rings method
3. Determination of the wavelength of mercury light by plane diffraction grating
4. Determination of wavelength of laser light by normal incidence method
5. Determination of the acceptance angle & Numerical Aperture of a given Optical Fiber
6. Determination of the energy band gap of a given semi-conductor
7. Determination of the temperature co-efficient of resistance of a given Thermister
8. Determination of the resolving power of grating.

Virtual Lab Experiments

9. Determination of the Brewster's angle (Angle of polarization).
10. Determination of the Hall coefficient of the given sample material by Hall Effect.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1							2				1	
CO2	3	1							2				1	
CO3	3	1							2				1	
CO4	3	1							2				1	
CO5	3	1							2				1	
CO*	3	1							2				1	

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - II Semester

S. No.	Course code	Course Title	L	T	P	Credits
8	R20MEC-ES1205	Engineering Workshop & IT Workshop Lab	0	0	3	1.5

Course Objective:

- Familiarize different wood working operation in carpentry.
- Understand to built different parts with sheet metal.
- Familiarize various fitting operations.
- Understand the smithy and black smithy operations for real world applications.
- Identify different types of electrical house wiring connections.
- Understand the basic components and peripherals of a computer

Course Outcomes: After completion of this lab the student will be able to

1. Apply wood working skills in real world applications. (L3)
2. Build different parts with fitting in engineering applications. (L3)
3. Develop various basic prototypes in black smith & tiny smith applications. (L3)
4. Apply different types of basic electric circuit connections. (L3)
5. Understand the basic components, peripherals and basic operations of a computer. (L3)

List of Experiments (Engineering

Workshop) Carpentry (Any Two)

1 T-Lap Joint
2 Cross Lap Joint
3 Dovetail Joint
4 Mortise and Tennon Joint

Fitting (Any Two)

5 Vee Fit
6 Square Fit
7 Half Round Fit
8 Dovetail Fit

Black Smithy (Any One)

9 Round rod to Square
10 S-Hook
11 Round Rod to Flat Ring
12 Round Rod to Square

headed bolt

House Wiring (Any Two)

13 Parallel / Series Connection of three bulbs
14 Stair Case wiring
15 Florescent Lamp Fitting
16 Measurement of Earth Resistance

Tin Smithy (Any Two)

17 Taper Tray

18 Square Box without lid
19 Open Scoop
20 Funnel

List of Experiments (IT Workshop)

1 System Assembling, Disassembling and identification of Parts / Peripherals
2 Operating System Installation-Install Operating Systems like Windows, Linux along with necessary Device Drivers.
3 MS-Office / Open Office
   a) Word - Formatting, Page Borders, Reviewing, Equations, symbols.
   b) Spread Sheet - organize data, usage of formula, graphs, charts.
   c) Power point - features of power point, guidelines for preparing an effective presentation.
   d) Access- creation of database, validate data.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	1	-	1	1	-	-	2	-	-	2	2	-
CO2	1	1	2	-	1	1	-	-	2	-	-	2	2	-
CO3	1	1	2	-	2	1	-	-	2	-	-	3	2	-
CO4	2	2	2	-	1	1	-	-	2	-	-	2	2	-
CO5	1	2	2	-	1	1	-	-	2	-	-	3	2	1
CO*	1	2	2	-	1	1	-	-	2	-	-	3	2	1

** For Entire Course, CO vs. PO-PSO Mapping*

I Year - II Semester

S. No.	Course code	Course Title	L	T	P	Credits
9	R20BSH-MC1201	Environmental Science	3	0	0	0

Course Objective:

1. To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations.
2. Students get awareness on pollution that is caused due to the day to day activities of human life to minimize the environmental degradation.
3. To make student get awareness on the social issues, environmental legislation.

Course Outcomes:

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

1. Understand about the environment and natural resources. (L2)
2. Understands about various attributes of different types of pollution and their impacts on the environment and control methods along with waste management practices. (L2)
3. Illustrate about the ecosystem and knows the importance of conservation of biodiversity. (L2)
4. Relate the current environmental impacts with the societal problems.(L2)
5. Identify the current population explosion and their impacts environment.(L3)

UNIT – I

Multidisciplinary Nature of Environmental Studies: Definition, Multi disciplinary nature of environmental studies, Scope and Importance, Need for Public Awareness.

Natural Resources : Forest resources – Uses of forest resources, deforestation-causes, consequences, Water resources – Use and over utilization of surface and ground water, Floods, drought, dams – benefits and problems, Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources:, Effects of modern agriculture, fertilizer-pesticide related problems, water logging, salinity, Energy resources: Renewable and non-renewable resources – Natural resources and associated problems, Land Resources: Land degradation, Soil erosion, Desertification.

Specific Applications:

- Different conservation methods of different natural resources like aforestation programs, social forestry programs, water conservation practices like rainwater harvesting, soaking pits.

UNIT – II

Environmental Pollution and Solid Waste Management

Environmental Pollution: Definition, Cause, effects and control measures of (a) Air Pollution (b) Water pollution (c) Noise pollution

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes, e-waste management, Role of an individual in prevention of pollution.

Specific Applications: Different treatment methods for different types of pollution- cyclone separator, electrostatic precipitators, waste water treatment, solid waste management, e-waste management.

UNIT – III

Ecosystems, Biodiversity, and its Conservation

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem – Producers, consumers and decomposers, Food chains, food webs, Energy flow in the ecosystem, primary and secondary productivity, ecosystem regulation and development.

Biodiversity And Its Conservation: Definition: levels of biodiversity- genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity, India as a mega-diversity nation, Hot-spots of biodiversity- Indo Burma, Eastern Himalayas, Western Ghats, Threats to biodiversity- habitat loss, poaching of wildlife, Global environmental issues, Pollution, Man-wildlife conflicts, Conservation of biodiversity- In-situ and Ex-situ conservation of biodiversity.

Specific Applications:

- Different conservation methods like gene bank, seed bank and botanical garden.

UNIT –IV

Social Issues and the Environment

Social Issues And The Environment: Water conservation- rain water harvesting and watershed management, Resettlement and rehabilitation issues of people, its problems and concerns, case studies-current issue regarding the covid-19.. Climate change- global warming, acid rain, ozone layer depletion, Environmental legislation- Wildlife Protection Act, Forest Conservation Act. Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act.

Specific Applications:

- Water conservation practices like rain water harvesting, soaking pits and modern agricultural methods to minimize the environmental effects.
- Energy conservations methods in houses, industrial sector and commercial sector, apply environmental related laws in environmental issues.

UNIT – V

Human Population and Environmental Management:

Human Population: Population growth, Population explosion, Role of information Technology in Environment and human health.

Environmental management- Significance of EIA ,Environmental Impact Assessment-Methodology, Environmental Impact Statement, Environmental Management Plan, Environmental Audit- process.

Specific Applications:

- Information Technology in different natural calamities and health aspect point of view.
- Industrial and developmental activities.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain, Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Text Books

1. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014.
2. Text Book of Environmental Studies, K. Raghavan Nambiar, Scitech Publications.
3. Environmental Studies by Palaniswamy – Pearson education
4. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

References

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental Studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

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CO3	2	-	-	-	-	2	3	1	-	-	-	2	-	1
CO4	2	-	-	-	-	2	3	1	-	-	-	2	-	1
CO5	2	-	-	-	-	2	3	1	-	-	-	2	-	1
CO*	2	-	-	-	-	2	3	1	-	-	-	2	-	1

** For Entire Course, CO vs. PO-PSO Mapping*