GLOBAL INSTITUTE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE | NAAC Accreditation with ' A+ ' Grade | Accredited by NBA | Affiliated to JNTUH)

Beside Moinabad Police Station, Chilkur (V), Moinabad (M), R.R. Dist, T.S. – 501504.

OUTCOME BASED EDUCATION
WITH
CHOICE BASED CREDIT SYSTEM

BACHELOR OF TECHNOLOGY

ACADEMIC REGULATIONS, COURSE CATALOGUE AND SYLLABUS - GR 24

B.Tech Regular Four Year Degree Program
(for the batches admitted from the academic year 2024 - 2025)

&

B.Tech (Lateral Entry Scheme)
(for the batches admitted from the academic year 2025 - 2026)

These rules and regulation may be altered / changed from time to time by the academic council
FAILURE TO READ AND UNDERSTAND THE RULES IS NOT EXCUSE

VISION

To produce technologically skilled engineers of world class competency to address global challenges

MISSION

M1: To offer quality education for social upliftment that is affordable and accessible to all and in particular to rural students.

M2: To provide academic freedom, generate, disseminate and preserve knowledge with inter disciplinary approach in order to meet advanced industrial standards.

M3: To enable students to master innovative methodologies for research and skills required to become an entrepreneur.

M4: To emphasize on human values, professional ethics, social responsibility and environmental sustainability.

QUALITY POLICY

Global Institute of Engineering and Technology is committed to provide quality education through the state-of-the-art infrastructural and instructional facilities, Global Benchmarking, HR Synergy, consistent value enhancement, continual motivation and nurturing creativity.

PROGRAM OUTCOMES (PO'S)

Engineering Graduates will be able to:

PO1: **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **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.

PO3: **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.

PO4: **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.

PO5: **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: **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.

PO7: **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.

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **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.

PO11: **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.

PO12: **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.

CONTENTS

"Take up one idea.
Make that one idea your life-think of it, dream of it, live on that idea.
Let the brain muscles, nerves, every part of your body be full of that idea and just leave every other idea alone. This is the way to success"

Swami Vivekananda

PRELIMINARY DEFINITIONS AND NOMENCLATURES

AICTE : Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as Autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University, Hyderabad) and State Government.

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., (one odd+ one even) and one supplementary semester.

Branch: Means specialization in a program like B.Tech degree program in Electronics and Communication Engineering, B.Tech Degree program in Computer Science and Engineering etc.

Board of Studies (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Backlog Course: A course is considered to be a backlog course, if the student has obtained a failure grade (F) in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry etc., are considered to be foundational in nature.

Commission: Means University Grants Commission (UGC), New Delhi.

Choice Based Credit System: The credit-based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

Certificate Course: It is a course that makes a student to have hands-on expertise and skills required for holistic development in a specific area/field.

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Continuous Internal Examination: It is an examination conducted towards sessional assessment.

Core: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Course: A course is offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

Credit point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff, and other resources in the process of study for a degree.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and/ or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

Experiential Engineering Education (ExEEd): Engineering entrepreneurship requires strong technical skills in engineering design and computation with key business skills from marketing to business model generation. Our students require sufficient skills to innovate in existing companies or create their own.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

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

Institute: Means Global Institute of Engineering and Technology (Autonomous), Moinabad unless indicated otherwise by the context.

Massive Open Online Courses (MOOC): MOOC courses inculcate the habit of self- learning. MOOC courses would be additional choices in all the elective group courses.

Minor: Minor are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech degree.

Pre-requisite: A specific course, the knowledge of which is required to complete before student register another course at the next grade level.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Means, UG degree program: Bachelor of Technology (B.Tech); PG degree program: Master of Technology (M.Tech) *I* Master of Business Administration (MBA).

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research-based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit-based course and is to be planned carefully by the student.

Regulations: The regulations, common to all B.Tech programs offered by Institute, are designated as "GR-24" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 16 weeks of academic work equivalent to normally minimum of 90 working days. Odd semester commences usually in July and even semester in December of every year.

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

S/he: Means "she" and "he" both.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

University: Means Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, is an affiliating University.

PREFACE

Dear Students,

The focus at GIET is to deliver value-based education with academically well qualified faculty and infrastructure. It is a matter of pride that GIET continues to be the preferred destination for students to pursue an engineering degree.

In the year 2023, GIET was granted academic autonomy status by University Grants Commissions, New Delhi under Jawaharlal Nehru Technology University Hyderabad. From then onwards, our prime focus is on developing and delivering a curriculum which caters to the needs of various stakeholders. The curriculum has unique features enabling students to develop critical thinking, solve problems analyze socially relevant issues, etc. The academic cycle designed on the basis of Outcome Based Education (OBE) strongly emphasizes continuous improvement and this has made our curriculum responsive to current requirements.

The curriculum at GIET has been developed by experts from academia and industry and it has unique features to enhance problem solving skills apart from academic enrichment. The curriculum of B.Tech program has been thoroughly revised as per AICTE / UGC / JNTUH guidelines and have incorporated unique features such as competency training / coding, industry driven elective, internship and many more. The curriculum is designed in a way so as to impart engineering education in a holistic approach towards Excellence.

I hope you will have a fruitful stay at GIET.

Dr. P Raja Rao

Principal

GLOBAL INSTITUTE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

ACADEMIC REGULATIONS - GR24

B.Tech Regular Four Year Degree Program
(for the batches admitted from the academic year 2024 - 2025)

&

B.Tech (Lateral Entry Scheme)
(for the batches admitted from the academic year 2025 - 2026)

For pursuing four year undergraduate Bachelor of Technology (B.Tech) degree program of study in engineering offered by Global Institute of Engineering & Technology under Autonomous status.

A student shall undergo the prescribed courses as given in the program curriculum to obtain his / her degree in major in which he/she is admitted with 160 credits in the entire program of 4 years. Additional 20/18 credits can be acquired for the degree of B.Tech **Minor in Engineering.** These additional 20/18 credits will have to be acquired with Massive Open Online Courses (MOOCs) / courses offered by the respective department, to tap the zeal and excitement of learning beyond the classrooms. This creates an excellent opportunity for students to acquire the necessary skill set for employability through massive open online courses where the rare expertise of world-famous experts from academics and industry are available.

Separate certificate will be issued in addition to major degree program mentioning that the student has cleared Honours / Minor specialization in respective courses.

1. CHOICE BASED CREDIT SYSTEM

The credit-based semester system provides flexibility in designing program curriculum and assigning credits based on the course content and hours of teaching. The Choice Based Credit System (CBCS) provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

A course defines learning objectives and learning outcomes and comprises lectures/ tutorials/ laboratory work / field work / project work / seminars / assignments / MOOCs / alternative assessment tools / presentations/ self-study etc., or a combination of some of these. Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

2. MEDIUM OF INSTRUCTION

The medium of instruction shall be **English** for all courses, examinations, seminar presentations and project work. The program curriculum will comprise courses of study as given in course structure, in accordance with the prescribed syllabi.

3. PROGRAMS OFFERED

Presently, the institute is offering Bachelor of Technology (B.Tech) degree programs in six disciplines. The various programs and their two-letter unique codes for BoS and Branch Codes are given in Table 1.

Table 1: B.Tech Programs offered

S.No.	Name of the Program	Title	Branch	Code
1	Computer Science and Engineering	CS	CSE	05
2	Computer Science and Engineering (AI & ML)	CA	CSM	66
3	Computer Science and Engineering (Data Science)	CD	CSD	67
4	Electronics & Communication Engineering	EC	ECE	04
5	Civil Engineering	CE	CIV	01
6	Mechanical Engineering	ME	MEC	03

4. SEMESTER STRUCTURE

Each academic year is divided into two semesters, **ODD and EVEN** semester. Both the semesters have regular class work.

4.1 Each semester shall be of 21 weeks (Table 2) duration, and this period includes time for course registration, regular class work, examination preparation, and conduction of examinations.

4.2 Each semester shall have a minimum of 90 Instructional / working days.

4.3 The academic calendar for both Odd and Even semester shown in Table 2 is declared at the beginning of the academic year.

Table 2: Academic Calendar

FIRST SEMESTER (21 WEEKS)	I Spell Instruction Period	8 weeks	19 weeks
	I Continuous Internal Assessment Examinations (Mid-term)	1 week	
	II Spell Instruction Period	8 weeks	
	II Continuous Internal Assessment Examinations (Mid-term)	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Exams (if any)			3 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Continuous Internal Assessment Examinations (Mid-term)	1 week	
	II Spell Instruction Period	8 weeks	
	II Continuous Internal Assessment Examinations (Mid-term)	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Exams (if any)			3 weeks

4.4 Students admitted on transfer from JNTUH affiliated institutes, universities and other institutes in the courses in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.

5. CREDIT SYSTEM

The B.Tech Program shall consist of a number of courses and each course shall be assigned with credits. The curriculum shall comprise Program Core Courses (PCC), Program Elective Courses (PEC), Open Elective Courses (OEC), Laboratory Courses, Mandatory Courses (MC), Value Added Courses (VAC), Experiential Engineering Education (ExEEd), Internship and Project work.

Depending on the complexity and volume of the course, the number of contact periods per week will be assigned. Each theory and laboratory course carries credits based on the number of hours/ weeks.

- Contact classes (Theory): 1 credit per lecture hour per week, 1 credit per tutorial hour per week.
- Laboratory hours (Practical): 1 credit for 2 practical hours per week.
- Project work: 1 credit for 2 hours of project work per week.
- Experiential Engineering Education (ExEEd): 1 credit for two per hours.
- Mandatory courses/ Value added courses: No credit is awarded.

Credit distribution for courses offered is given in Table 3.

Table 3: Credit distribution

S.No.	Course	Hours	Credits
1	Theory courses	2 / 3 / 4	2 / 3 / 4
2	Program elective courses / Open elective courses	3 / 2	3 / 2
3	Laboratory courses	2 / 3 / 4	1 / 1.5 / 2
4	Mandatory course / Value added course	-	0
5	Project Work: Phase – I and II	-	14

Major benefits of adopting the credit system are listed below:

- Quantification and uniformity in the listing of courses for all programs at institute, like core, electives and project work.
- Ease of allocation of courses under different heads by using their credits to meet national / international practices in technical education.
- Convenience to specify the minimum / maximum limits of course load and its average per semester in the form of credits to be earned by a student.
- Flexibility in program duration for students by enabling them to pace their course load within minimum/maximum limits based on their preparation and capabilities.
- Wider choice of courses available from any department of the same institute or even from other similar institute, either for credit or for audit.
- Improved facility for students to optimize their learning by availing of transfer of credits earned by them from one College to another.

6. CURRICULAR COMPONENTS

Courses in a curriculum may be of three kinds: **Foundation / Skill, Program core courses, Program elective courses and Open elective courses.**

Foundation / Skill Course:

Foundation courses are the courses based upon the content leads to enhancement of skill and knowledge as well as value based and are aimed at man making education. Skill courses are those areas in which one needs to develop a set of skills to learn anything at all. They are fundamental to learning any course.

Program core courses (PCC):

There may be a program core course in every semester. This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a program in the said discipline of study.

Program elective courses (PEC) / Open elective courses (OEC):

Electives provide breadth of experience in respective branch and application areas. The program elective course(s) is a course which can be chosen from a pool of courses. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/ domain
- Nurturing student's proficiency/ skill.

An elective may be program elective, is a discipline centric focusing on those courses which add generic proficiency to the students or may be Open elective course, chosen from unrelated disciplines.

There is list of professional elective courses; students can choose not more than two courses from each track. Overall, students can opt for six professional elective courses which suit their project work in consultation with the faculty advisor / mentor. Nevertheless, one course from each of the three open electives has to be selected. A student may also opt for more elective courses in his/her area of interest. Every course of the B.Tech program will be placed in one of the eight categories with minimum credits as listed in the Table 4.

Table 4: Category Wise Distribution of Credits

S.No.	Category	Breakup of Credits
1	Humanities and Social Sciences (HSMC), including Management.	07
2	Basic Science Courses (BSC) including Mathematics, Physics and Chemistry.	28
3	Engineering Science Courses (ESC), including Workshop, Drawing, ExEEd, Basics of Electrical/ Electronics/ Mechanical/ Computer Engineering.	09
4	Program Core Courses (PCC), relevant to the chosen specialization / branch.	75
5	Program Elective Courses (PEC), relevant to the chosen specialization / branch.	18
6	Open Elective Courses (OEC), from other technical and/ or emerging course areas.	09
7	Project work (PROJ) / Full Semester Internship (FSI) Project work	14
8	Mandatory Courses (MC)/ Value Added Courses (VAC)	Non-Credit
TOTAL		**160**

7. EVALUATION METHODOLOGY

Total marks for each course shall be based on Continuous Internal Assessment (CIA) and Semester End Examinations (SEE). There shall have a uniform pattern of 40:60 for CIA and SEE of both theory and practical courses. The institute shall conduct multiple continuous internal assessments (CIA) for theory courses. All the performances of a student shall be considered for Continuous Internal Assessment (CIA) marks.

Table 5: Outline for Continuous Internal Assessments (CIA-1 and CIA-2) and SEE:

Activities	CIA-1	CIA-2	SEE	Total Marks
Continuous Internal Examination (CIE)	30 marks	30 marks		30 marks (Avg.)
Definitions and Terminology *I* Quiz	5 marks	5 marks		5 marks (Avg.)
Tech Talk/ Assignment	5 marks	5 marks		5 marks (Avg.)
Semester End Examination (SEE)			60 marks	60 marks
Total	--	--	100 marks	

7.1 Continuous Internal Assessments (CIA-1 and CIA-2):

Assessment is an ongoing process that begins with establishing clear and measurable expected outcomes of student learning, provides students with sufficient opportunities to achieve those outcomes, and concludes with gathering and interpreting evidence to determine how well students' learning matches expectations.

The first component (CIA-1) of assessment is for 30 marks, definitions and terminology/ quiz carry 05 marks and 05 marks allotted for Tech talk / Assignments. This assessment and score process should be completed after completing of first 50% of syllabus ($2^{1/2}$) of the course/s and within 45 working days of semester program.

The second component (CIA-2) of assessment is for 30 marks, definitions and terminology / quiz carry 05 marks and 05 marks are allotted for Tech talk / Assignments. This assessment and score process should be completed after completing of remaining 50% of syllabus ($2^{1/2}$) of the course/s and within 45 working days of semester program.

In case of a student who has failed to attend the CIA1 or CIA2 on a scheduled date, shall be deemed that the student has dropped the examination. However, in case a student could not take the test on scheduled date due to genuine reasons, may appeal to the HOD / Principal. The HOD / Principal in consultation with the class in-charge shall decide about the genuineness of the case and decide to conduct Make-Up Examination to such candidate on the date fixed by the Examinations Control Office but before commencement of the concerned semester end examinations.

7.2 Definitions and terminology / Quiz

Definitions and Terminology/Quiz: The conduction of definitions and terminology/Quiz is completely offline. The faculty should ask 3 to 5 questions from each and every module/unit.
The course handling faculty needs to submit detailed document by clearly mentioning the answer to the questions asked to their respective department who in turn shall submit it to the office of the Controller of Examinations.

7.3 Tech Talk/ Assignment

Tech Talk: Technical talks cover a wide range of technical concepts and ideas. For conduction of Tech Talk faculty has to submit latest topics from IEEE, CSI, magazines etc.

Assignments: The assignments develop different skills and increase their knowledge base significantly. It provides the evidence for the faculty that the students have achieved the goals. It helps the faculty to evaluate the student's understanding of the course. The output can be judged using sensory perception (observing, reading, tasting etc.). Faculty should prepare 3 to 5 assignment questions from each module/unit and submit the same to respective department who in turn shall submit it to the office of the Controller of Examinations.

7.4 Semester End Examination (SEE)

The semester end examinations (SEE), for theory courses, will be conducted for 60 marks. The syllabus for the theory courses is divided into FIVE units and each unit carries equal weightage in terms of marks distribution. The question paper has two parts (A and B). Part A consists of 10 Short Answer Questions (No Choice), where each question carries one mark. Two SAQs will be given from each unit. Part B consists of 10 questions with two questions from each unit with internal choice and each question carries 10 marks.
The duration of semester end examination is 3 hours.

7.5 Passing Criteria:

To maintain high standards in all aspects of examinations at the institute, the institute shall follow the standards of passing at CIA (Average of CIA-1 and CIA-2) and SEE for each course. However, the student's performance in a course shall be judged by taking into account the results of CIE and SEE individually and also together, as shown below:

a) A minimum of 35% of marks to be secured by averaging marks in CIA-1 and CIA-2 for appearing for a SEE theory examination.

b) A minimum of 35% of marks to be scored in SEE for passing a theory course.

c) A minimum of 40% of marks in CIA+ SEE for passing a theory course.

7.6 Supplementary Examinations

Supplementary examinations for the odd semester shall be conducted with the regular examinations of even semester and vice versa. In case of failure in any course, a student may be permitted to register for the same course when offered.

Advanced supplementary examination will be conducted for VIII semester courses at the end of the program after declaration of results.

7.7 Laboratory Course

Evaluation methodology of laboratory course (CIA)

Each laboratory courses there shall be a CIA during the semester for 40 marks and 60 marks for SEE. The 40 marks for internal evaluation marks are awarded as follows:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components / procedure, expected outcome) which shall be evaluated for **10 marks.**
2. **10 marks** for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for **10 marks.**
4. The remaining **10 marks** are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation which shall be evaluated after completion of laboratory course and before semester end practical examination.

Evaluation methodology of laboratory course (SEE)

The Semester End Examination shall be conducted by an external examiner and the laboratory handling faculty. The external examiner shall be appointed from the other colleges which will be decided by the principal.

The Semester End Examination held for 3 hours. Total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
2. 15 for experiment/ program
3. 15 for evaluation of results
4. 10 marks for presentation on another experiment/program in the same laboratory course and
5. 10 marks for viva-voce on concerned laboratory course.

7.8 Mandatory Courses (MC)

These courses are among the compulsory courses will not carry any credits. However, a pass in each such course during the program shall be necessary requirement for the student to qualify for the award of degree. No marks or letter grades shall be allotted for mandatory/non-credit courses. Its result shall be declared as **"Satisfactory" or "Not Satisfactory"** performance.

7.9 Value Added Courses (VAC)

1. Introduction

Value-Added courses are not part of the curriculum and designed to provide necessary skills to increase the employability quotient and equip the students with essential skills to succeed in life.

Institute offers a wide variety of value-added Courses which shall be conducted after class hours. These courses shall be conducted by experts or in-house staff and help students stand apart from the rest in the job market by adding further value to their resume. These value-added courses will be mostly independent to each type of the fields.

2. Objectives

Objectives of the value-added course are:

- Provide students an understanding of the expectations of industry.
- Improve employability skills of students.
- Bridge the skill gaps and make students industry ready.

- Provide an opportunity to students develop their inter-disciplinary skills.
- Mould students as job providers rather than job seekers.

3. Designing the Courses

- Before designing the syllabus, the feedback from the employers, alumni and industry people will be analyzed and considered to select and design an appropriate course by identifying the gaps and also understand the expectations for current and emerging trends.
- Any new value-added course developed by a department should be placed before the Board of Studies for approval.
- The course offered should not be the same as any course listed in the curriculum of the respective Program *I* or any other program offered in the institute.
- A unique course code is to be given for each course.

4. Guidelines for conducting value added courses

- Value Added Course is not mandatory to qualify for any program.
- It is a teacher assisted learning course open to all students without any additional fee.
- Classes for VAC will be conducted beyond the regular class work only.
- A student will be permitted to register only one value added course in a semester.

5. Duration and Venue

- The duration of value-added course should not be less than 30 hours.
- The respective Head of the department shall provide class room/s based on the number of students/batches.

6. Procedure for Registration:

The list of value-added courses shall be displayed in the institute website along with the syllabus, objectives and outcomes. A student shall register for a value-added course offered during the semester by submitting the duly filled in registration form. The Head of the department shall segregate the list of students enrolled for the value-added course and submit the details to Dean of academics before the start of course.

7. Attendance

Value added course handling faculty shall be responsible for the maintenance of attendance and assessment who have registered for the course.

- The record shall contain details of the student's attendance, number of classes attended and also Record shall also contain the organisation of lesson plan of the Course Instructor.
- The record shall be submitted to the Head of the department for monitoring the attendance.
- At the end of the semester, the record shall be duly signed by the course coordinator and the Head of the Department and placed in safe custody for any future verification.
- Each student shall have a minimum of 75% attendance in all the courses of the particular semester failing which he or she will not be permitted to write the semester end examination.

8. Passing Requirement and Grading

- The passing requirement for value added courses shall be 40% of the marks prescribed for the course.
- A candidate who has not secured a minimum of 40% of marks in a course (internal and end-term) shall reappear for the course in the next semester/year.
- The grades obtained in value-added courses will not be included for calculating the CGPA.

9. Course Completion

- Students will get a certificate after they have registered for, written the exam and successfully passed.
- The students who have successfully completed the value-added Course shall be issued with a Certificate duly signed by the Authorized signatories.

Note: Apart from the above, students can also register and get the value-added course completion certificate by registering the courses from SWAYAM, e-PG patashala (NPTEL).

7.10 Experiential Engineering Education (ExEED)

Engineering entrepreneurship requires strong technical skills in engineering design and computation with key business skills from marketing to business model generation. Students require sufficient skills to innovate in existing companies or create their own.

This course will be evaluated for a total of 100 marks consisting of 40 marks for internal assessment and 60 marks for semester end Examination. Out of 40 marks of internal assessment, students has to submit Innovative Idea in a team of four members in the given format. The semester end examination for 60 marks shall be conducted internally, students has to present the Innovative Idea and it will be evaluated by internal ExEEd faculty with at least one faculty member as examiner from the industry, both nominated by the Principal from the panel of experts recommended by the Dean-T&I.

Dean of Technology and Innovation & Dean Assessments, Accreditations, Ranking & NPTEL, Co Ordinator IQAC of the institute design and teach ExL power skills courses, to shape the student's future. All the below mentioned Experiential Engineering Education (ExEED) courses are evaluated for one credit each.

ExL - Essentials of Innovation: This course creates platform where students experience a hands-on approach to learning about engineering. It focuses on educating the students about diversified platforms for learning the skills, career development, innovations, entrepreneurship etc. Based on the requirements this course is offered in first or second semester.

ExL - Prototype / Model Development: It covers the application of relevant technologies to create interaction prototypes. Students learn about different kinds of prototyping activities involved in designing low-fidelity and high-fidelity prototypes such as POC models, web pages and mobile interfaces etc. This course introduces key concepts, processes and principles of industry driven digital fabrication in a manufacturing environment. Students will undertake small-scale, team-based project work to create fabricated objects that relate to a local industry, organisation or community need or opportunity.

7.11 Project Work

The topic should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of the work be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with a specific outcome.

Project report will be evaluated for 100 marks in total. Assessment will be done for 100 marks out of which, the supervisor / guide will evaluate for 40 marks based on the work and presentation / execution of the work. Subdivision for the remaining 60 marks is based on publication, report, presentation, execution and viva-voce. Evaluation shall be done by a committee comprising the supervisor, Head of the department, and an examiner nominated by the Principal.

7.12 Skill enhancement project

Students must submit the skill enhancement project report of the specified course which are included in the course catalogue. If the student has failed to submit the report or not reached upto the mark, needs to re-register the course in next semesters till completion.

7.13 Project work

The student's project activity is spread over in VII semester and in VIII semesters. A student shall carry out the project work under the supervision of a faculty member or in collaboration with an Industry, R&D organization or another academic institution / University where sufficient facilities exist to carry out the project work.

Project work (Phase - I) starts in VII semester as it takes a vital role in campus hiring process. Students shall select project titles at the middle of the VI semester. Two reviews are conducted by department review committee (DRC). Student must submit a project report summarizing the work done up to design phase/prototype by the end of VII semester. The semester end examination for project work (Phase-I) is evaluated based on the project report submitted and a viva-voce exam for 100 marks by a committee comprising the head of the department, the project supervisor and an external examiner nominated by the Principal.

Project Work (Phase - II) starts in VIII semester, and it shall be evaluated for 100 marks out of which 40 marks towards continuous internal assessment and 60 marks for semester end examination. Two reviews are to be conducted by DRC on the progress of the project for 40 marks. The semester end examination shall be based on the final report submitted and a viva-voce exam for 60 marks by a committee comprising the head of the department, the project supervisor and an external examiner nominated by the Principal.

A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

7.14 Real Time Projects/ Field Projects / Internship Academic attachment:

The Field Projects (FP) / Internships are mandatory for the students admitted from the academic year 2024-25 onwards. It is spread over from II semester to VI semester.

Real Time Project/ Field Project: Real Time Project (RTP)/ Field project (FP) integrates theory and practice by providing students with an opportunity to work on real-world challenges. It can be used to learn about the functioning and manufacturing procedures of a factory. Besides this, student can also learn about the geographical factors of the region for the specific products /equipment.

Internship is an integral part of the academic curriculum; it is a learning activity in which a student fortifies and deepens his/her theoretical knowledge and skills attained in the classrooms by integrating with practical activities. It offers the students an opportunity to gain hands-on industrial or organizational exposure; to integrate the knowledge and skills acquired through the coursework; interact with professionals and other interns; and to improve their presentation, writing, and communication skills. Internship often acts as a gateway for final placement for many students.

Table 6: Possibility of availing opportunities during semester breaks.

S.No.	Schedule	Duration	Type
1	At the end of II semester / Before commencement of III semester	2 Weeks	Field Project
2	At the end of IV semester/ Before commencement of V semester	2 Weeks	Internship
3	At the end of VI semester / Before commencement of VII semester	2 Weeks	Internship

Evaluation Methodology of Field Project / Internships:

The evaluation of the field project / field practicum / Internships will be done before commencement of subsequent semester specified in Table: 6. The students have to submit a detailed report of field project/ field practicum / Internships through online portal and also carry hard copy of report with geo-tagged photographs. The committee will evaluate by enclosing their comments like **satisfactory or not satisfactory.** If students get not satisfactory results, reports need to be re-submit in the respective department once again for evaluation.

8. ATTENDANCE REQUIREMENTS AND DETENTION POLICY

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

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

8.3 A stipulated fee of ₹3000/- shall be payable for condoning of shortage of attendance.

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

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

then alternate electives may be chosen from the same set of elective courses offered under that category.

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

8.7 A student detained in a semester due to shortage of attendance may be re-admitted in the same Semester in the next academic year for fulfilment of academic requirements. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which the student has been detained.

8.8 A student detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits. The academic regulations under which the student has been readmitted shall be applicable to him.

9. CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

9.1 Semester end examination shall be conducted by the Controller of Examinations (COE) by inviting question papers from the external examiners.

9.2 COE shall invite 3 - 9 internal / external examiners to evaluate all the semester end examination answer books on a prescribed date(s). Practical laboratory examinations are conducted involving external examiners from the panel of examiners submitted by the concerned Chairman/Chairperson BoS.

9.3 Examinations control office shall consolidate the marks awarded by examiner/s and award the grades.

10. SCHEME FOR THE AWARD OF GRADE

10.1 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory course, if s/he secures,

a) Not less than 35% marks for each theory course in the semester end examination, and
b) A minimum of 40% marks for each theory course considering Continuous Internal Assessment (CIA) and Semester End Examination (SEE).

10.2 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each Laboratory/ Project work, if s/he secures,

a) Not less than 40% marks for each Laboratory / Project work course in the semester end examination,
b) A minimum of 40% marks for each Laboratory / Project work course considering both internal and semester end examination.

10.3 If a candidate fails to secure a pass in a particular course, it is mandatory that s/he shall register and reappear for the examination in that course during the next semester when examination is conducted in that course. It is mandatory that s/he should continue to register and reappear for the examination till s/he secures a pass.

10.4 A student shall be declared successful or 'passed' in a semester, if he secures a Grade Point ≥ 5 ('C' grade or above) in every course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire under graduate programme, only when gets a CGPA ≥ 5.0 for the award of the degree as required.

11. LETTER GRADES AND GRADE POINTS

11.1 Performances of students in each course are expressed in terms of marks as well as in Letter Grades based on absolute grading system. The UGC recommends a 10-point grading system with the following letter grades as given in the Table 7.

Table 7: Grade Points Scale (Absolute Grading)

% of Marks Secured in a Course (Class Intervals)	Letter Grade	Grade Point
Greater than or equal to 90%	0 (Outstanding)	10
80 and less than 90%	A+ (Excellent)	9

70 and less than 80%	A (Very Good)	8
60 and less than 70%	B+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below40%	F (Fail)	0
Absent	AB (Absent)	0

11.2 A student is deemed to have passed and acquired to correspondent credits in particular course if s/he obtains any one of the following grades: "O", "A+", "A", "B+", "B", "C".

11.3 A student obtaining Grade F shall be considered Failed and will be required to reappear in the examination.

11.4 For non credit courses, "PP" or "NP" is indicated instead of the letter grade and this will not be counted for the computation of SGPA / CGPA.

11.5 At the end of each semester, the institute issues grade sheet indicating the SGPA and CGPA of the student. However, grade sheet will not be issued to the student if s/he has any outstanding dues.

Table 8: Percentage Equivalence of Grade Points (for a 10 – Point Scale)

Grade Point	Percentage of Marks / Class
5.5	50
6.0	55
6.5	60
7.0	65
7.5	70
8.0	75

Note:

(1) The following Formula for Conversion of CGPA to percentage of marks to be used only after a student has successfully completed the program:

Percentage of Marks = (CGPA - 0.5) x 10

(2) Class designation:
≥75% (First Class with Distinction),
≥ 60% and <75% (First Class),
<60% and ≥ 50% (Second Class).
≥ 40% and <50% (Pass Class).

(3) The SGPA will be computed and printed on the Memorandum of Grades only if the candidate passes in all the courses offered and gets minimum C grade in all the courses.

(4) CGPA is calculated only when the candidate passes in all the courses offered in all the semesters.

12. COMPUTATION OF SGPA AND CGPA

The UGC recommends to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The credit points earned by a student are used for calculating the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA), both of which are important performance indices of the student. SGPA is equal to the sum of all the total points earned by the student in a given semester divided by the number of credits registered by the student in that semester. CGPA gives the sum of all the total points earned in all the previous semesters and the current semester divided by the number of credits registered in all these semesters. Thus,

$$SGPA = \sum_{i=1}^{n} (C_i \quad G_i \ ) / \sum_{i=1}^{n} C_i$$

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 and n represent the number of courses in which a student is registered in the concerned semester.

$$CGPA = \sum_{j=1}^{m} (C_j \quad G_j \ ) / \sum_{j=1}^{m} C_j$$

Where, S_j is the SGPA of the j^{th} semester and C_j is the total number of credits upto the semester and m represent the number of semesters completed in which a student registered upto the semester.

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

13.0 ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA

13.1 Illustration for SGPA

Course Name	Course Credits	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 1	4	A	8	4 X 8 = 32
Course 2	4	O	10	4 X 10 = 40
Course 3	4	C	5	4 X 5 = 20
Course 4	3	B	6	3 X 6 = 18
Course 5	3	A+	9	3 X 9 = 27
Course 6	3	C	5	3 X 5 = 15
	21			**152**

Thus, SGPA = 152 / 21= 7.24

13.2 Illustration for calculation of CGPA upto 3rd semester

Semester	Course Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	**69**		**Total Credits**	**518**

Thus, CGPA = 518 / 69= 7.51

- The calculation process of CGPA illustrated above will be followed for each subsequent semester until 3th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. program.
- For merit ranking or comparison purposes or any other listing, only the rounded off values of the CGPAs will be used.
- SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all courses of that semester are passed in first attempt, otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting s/he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

14. REVIEW OF SEE THEORY ANSWER BOOKS

If the examinee is not satisfied with the marks awarded, s/he may apply for revaluation of answer book in prescribed format online within five (5) working days from the date of declaration of result of the examination or issue of the statement of marks, whichever is earlier. The revaluation facility shall be for theory papers only. The revaluation of answer book shall not be permitted in respect of the marks awarded to the scripts of practical examination / project work (including theory part) and in viva voce / oral / comprehensive examinations.

The re-evaluation will be done by a second independent examiner. The result after re-evaluation shall be as follows:

1. The revaluation marks are considered only if the difference between the original award and award on re-evaluation is more than equal to 15% of 60 marks (09 marks).
2. If the difference between the original award and the award on re-evaluation is more than 20% (12 marks), a third evaluator is to be appointed and the average of two nearest awards (in the range of 15%) shall be considered.

15. PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 8.

15.1 For students admitted into B.Tech (Regular) program

15.1.1 A student will not be promoted from II semester to III semester unless s/he fulfils the academic requirement of securing 25% of the total credits (rounded to the next lowest integer) from I and II semester examinations, whether the candidate takes the examination(s) or not.

15.1.2 A student will not be promoted from IV semester to V semester unless s/he fulfils the academic requirement of securing 25% of the total credits (rounded to the next lowest integer) up to IV semester, from all the examinations, whether the candidate takes the examination(s) or not.

15.1.3 A student shall be promoted from VI semester to VII semester only if s/he fulfils the academic requirements of securing 25% of the total credits (rounded to the next lowest integer) up to IV semester from all the examinations, whether the candidate takes the examination(s) or not.

15.1.4 A student shall register for all the 160 credits and earn all the 160 credits. Marks obtained in all the 160 credits shall be considered for the award of the Grade.

Table 9: Promotion policy B.Tech (Regular) program

S.No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to Second year first semester	(i) Regular course of study of first year second semester. (ii) Must have secured at least 10 credits out of 40 credits i.e., 25% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student appears in those examinations or not.

3	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 20 credits out of 80 credits i.e., 25% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student appears in those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester
6	Third year second semester to Fourth year first semester	Regular course of study of third year second semester.
7	Fourth year first semester to fourth year second semester	Regular course of study of third year first semester

15.2 For students admitted into B.Tech (Lateral entry students)

15.2.1 A student will not be promoted from IV semester to V semester unless s/he fulfils the academic requirement of securing 25% of the total credits (rounded to the next lowest integer) up to IV semester, from all the examinations, whether the candidate takes the examination(s) or not.

15.2.2 A student shall be promoted from VI semester to VII semester only if s/he fulfils the academic requirements of 25% of the total credits (rounded to the next lowest integer) up to VI semester from all the examinations, whether the candidate takes the examination(s) or not.

15.2.3 A student shall register for all the 120 credits and earn all the 120 credits. Marks obtained in all the 120 credits shall be considered for the award of the Grade.

Table 10: Promotion policy B.Tech (Lateral Entry) program

S.No.	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 10 credits out of 40 credits i.e., 25% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student appears in those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester
4	Third year second semester to Fourth year first semester	Regular course of study of third year second semester.
5	Fourth year first semester to fourth year second semester	Regular course of study of third year first semester

16. GRADUATION REQUIREMENTS

The following academic requirements shall be met for the award of the B.Tech degree.

16.1 Student shall register and acquire minimum attendance in all courses and secure 160 credits (with minimum CGPA of 5.0), for regular program and 120 credits (with minimum CGPA of 5.0), for lateral entry program. **There is NO exemption of credits in any case.**

16.2 A student of a regular program, who fails to earn 160 credits within **eight consecutive academic years** from the year of his/her admission with a minimum CGPA of 5.0, shall forfeit his/her degree and his/her admission stands cancelled.

16.3 A student of a lateral entry program who fails to earn 120 credits within **six consecutive academic years** from the year of his/her admission with a minimum CGPA of 5.0, shall forfeit his/her degree and his/her admission stands cancelled.

17. AWARD OF DEGREE

17.1 Classification of degree will be as follows:

CGPA>8.0	CGPA ≥ 7.0 and < 8.0	CGPA ≥ 6.0 and < 7.0	CGPA ≥ 5.0 and <6.0	CGPA< 5.0
First Class with Distinction	**First Class**	**Second Class**	**Pass Class**	**Fail**

17.2 A student with final CGPA (at the end of the under graduate programme) >8.0, and fulfilling the following conditions - shall be placed in **'first class with distinction'.** However,

a. Should have passed all the courses in **'first appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first semester.
b. Should have secured a CGPA >8.0, at the end of each of the 8 sequential semesters, starting from first semester onwards.
c. Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.
d. A student not fulfilling any of the above conditions with final CGPA >8.0 shall be placed in **'first class'.**

17.3 Students with final CGPA (at the end of the B.Tech program) ≥7.0 but <8.0 shall be placed in **'first class'.**

17.4 Students with final CGPA (at the end of the B.Tech program) ≥6.0 but <7.0, shall be placed in **'second class'.**

17.5 All other students who qualify for the award of the degree (as per item 18), with final CGPA (at the end of the B.Tech program) ≥5.0 but <6.0, shall be placed in **'pass class'.**

17.6 A student with final CGPA (at the end of the B.Tech program) <5.0 will not be eligible for the award of the degree.

17.7 Students fulfilling the conditions listed under item 17.2 alone will be eligible for award of **'Gold Medal'.**

All the candidates who register for the semester end examination will be issued a memorandum of grades sheet by the institute. Apart from the semester wise memorandum of grades sheet, the institute will issue the provisional certificate and consolidated grades memorandum course to the fulfilment of all the academic requirements.

18. B.TECH WITH MINOR IN ENGINEERING

Students acquiring 160 credits are eligible to get B.Tech degree in Engineering. A student will be eligible to get B.Tech degree with Minor in Engineering, if s/he completes an additional 20/18 credits (3/4 credits per course). These could be acquired through MOOCs from SWAYAM / NPTEL only. The list for MOOCs will be a dynamic one, as new courses are added from time to time. Few essential skill sets required for employability are also identified year wise. Students interested in doing MOOC courses shall register the course title at their department office at the start of the semester against the courses that are announced by the department. Any expense incurred for the MOOC course / summer program should be met by the students.

Students having no credit arrears and a CGPA of 7.5 or above at the end of the fourth semester are eligible to register for B.Tech Minor. After registering for the B.Tech Minor program, if a student fails in any course, s/he will not be eligible for B.Tech Minor.

Every department should develop and submit a Minor - courses list of 5 - 6 theory courses, laboratory and project work.

Minor in any other branch for Improving Employability.

Honours will be reflected in the degree certificate "B.Tech in XYZ Engineering with Minor in ABC".

18.1 B.Tech with Minor in Engineering

The key objectives of offering B.Tech with Minor program are:

- To expand the domain knowledge of the students in one of the other branches of engineering.
- To increase the employability of undergraduate students keeping in view of better opportunity in interdisciplinary areas of engineering & technology.
- To provide an opportunity to students to pursue their higher studies in the inter-disciplinary areas in addition to their own branch of study.
- To offer the knowledge in the areas which are identified as emerging technologies/thrust areas of Engineering.

Advantages of Minor in Engineering

The minors mentioned above are having lots of advantages and a few are listed below:

- To enable students to pursue allied academic interest in contemporary areas.
- To provide an academic mechanism for fulfilling multidisciplinary demands of industries.
- To provide effective yet flexible options for students to achieve basic to intermediate level competence in the Minor area.
- Provides an opportunity to students to become entrepreneurs and leaders by taking business/management minor.
- Combination in the diverse fields of engineering e.g., CSE (Major) + Electronics (Minor) combination increases placement prospects in chip designing companies.
- Provides an opportunity for applicants to pursue higher studies in an inter-disciplinary field of study.
- To increase the overall scope of the undergraduate degrees.

Academic Regulations for B.Tech Degree with Minor programs

1. The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. program.
2. For B. Tech. with Minor, a student needs to earn additional 18 credits (over and above the required 160 credits for B. Tech degree). The courses are offered from V semester to VII semester only, to obtain minor degree students required to obtain 18 credits.
3. After registering for the Minor program, if a student is unable to earn all the required 18 credits in a specified duration (twice the duration of the course), he/she shall not be awarded Minor degree. However, if the student earns all the required 160 credits of B.Tech, he/she will be awarded only B. Tech degree in the concerned branch.
4. There is no transfer of credits from Minor program courses to regular B. Tech. degree course & vice versa.
5. These 18 credits are to be earned from the additional courses offered by the host department in the institute as well as from the MOOCs platform.
6. For the course selected under MOOCs platform (NPTEL) following guidelines may be followed:
    a) Prior to registration of MOOCs courses, formal approval of the courses, by the institute is essential, before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the program and mode of evaluation etc.
    b) Minimum credits for MOOCs course must be equal to or more than the credits specified in the Minor course structure provided by the institute.
    c) Only Pass-grade / marks or above shall be considered for inclusion of grades in minor grade memo.

d) Any expenses incurred for the MOOCs courses are to be met by the students only.

7. The choice to opt/ take a Minor program is purely on the choice of the students.
8. The student shall be given a choice of withdrawing all the courses registered and / or the credits earned for Minor program at any time; and in that case the student will be awarded only B. Tech. degree in the concerned branch on earning the required credits of 160.
9. The student can choose only one Minor program along with his / her basic engineering degree.
10. The institute shall maintain a record of students registered and pursuing their Minor programs, minor program-wise and parent branch-wise.
11. The institute / department shall prepare the time-tables for each Minor course offered at their respective institutes without any overlap/clash with other courses of study in the respective semesters.

S.No.	Department	Minor scheme
1	Computer Science and Engineering / Computer Science and Engineering (AIML)/ Computer Science and Engineering (Data Science)	Big data and Analytics / Cyber Physical Systems, Information Security / Cognitive Science / Artificial Intelligence/ Machine Learning / Data Science / Internet of Things (IoT) / Cyber Security etc.
2	Electronics & Communication Engineering	Digital Communication / Signal Processing / Communication Networks / VLSI Design / Embedded Systems etc.

Eligibility conditions for the student to register for Minor course

a) A student can opt for B.Tech. degree with Minor program if she/he has no active backlogs till III semester at the time of entering into III year I semester.

b) Prior approval of mentor and Head of the Department for the enrolment into Minor program, before commencement of III year I Semester (V Semester), is mandatory.

c) If more than 50% of the students in a branch fulfill the eligibility criteria (as stated above), the number of students given eligibility should be limited to 50%.

19. TEMPORARY BREAK OF STUDY FROM THE PROGRAM

19.1 A candidate is normally not permitted to take a break from the study. However, if a candidate intends to temporarily discontinue the program in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the program in a later respective semester, s/he shall seek the approval from the Principal in advance. Such application shall be submitted before the last date for payment of examination fee of the semester and forwarded through the Head of the Department stating the reasons for such withdrawal together with supporting documents and endorsement of his/ her parent/ guardian.

19.2 The institute shall examine such an application and if it finds the case to be genuine, it may permit the student to temporarily withdraw from the program. Such permission is accorded only to those who do not have any outstanding dues / demand at the College / University level including tuition fees, any other fees, library materials etc.

19.3 The candidate has to rejoin the program after the break from the commencement of the respective semester as and when it is offered.

19.4 The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in clause 17. The maximum period includes the break period.

19.5 If any candidate is detained for any reason, the period of detention shall not be considered as 'Break of Study'.

20. TERMINATION FROM THE PROGRAM

The admission of a student to the program may be terminated and the student is asked to leave the institute in the following circumstances:

a. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.
b. A student shall not be permitted to study any semester more than three times during the entire program of study.
c. The student fails to satisfy the norms of discipline specified by the institute from time to time.

21. WITH-HOLDING OF RESULTS

If the candidate has not paid any dues to the institute / if any case of indiscipline / malpractice is pending against him, the results and the degree of the candidate will be withheld.

22. GRADUATION DAY

The institute shall have its own annual Graduation Day for the award of degrees to the students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

23. DISCIPLINE

Every student is required to observe discipline and decorum both inside and outside the institute and are expected not to indulge in any activity which will tend to bring down the honour of the institute. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations, he/she shall be liable for punitive action as prescribed by the institute from time to time.

24. GRIEVANCE REDRESSAL COMMITTEE

The institute shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD as the members. The committee shall solve all grievances related to the course under consideration.

25. TRANSITORY REGULATIONS

A candidate, who is detained or has discontinued a semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) he was originally admitted into and substitute courses were offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

a) Transfer candidates (from non-autonomous college affiliated to JNTUH):

A student who is following JNTUH curriculum, transferred from other college to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in their place as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUH for the award of degree. The total number of credits to be secured for the award of the degree will be the sum of the credits up to the previous semester under JNTUH regulations and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

b) Transfer candidates (from an autonomous college affiliated to JNTUH):

A student who has secured the required credits up to previous semester as per the regulations of other autonomous institutions shall also be permitted to be transferred to this institute. A student who is transferred from the other autonomous colleges to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such

candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in their place as decided by the Board of Studies. The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he is transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

c) Readmission

A student took admission in GR-24 Regulations, detained due to lack of required number of credits or shortage of attendance at the end of any semester is permitted to take re-admission at appropriate level under any regulations prevailing in the institute course to the following rules and regulations.

1. Student shall pass all the courses in the earlier scheme of regulations. However, in case of having backlog courses, they shall be cleared by appearing for supplementary examinations conducted under earlier regulations from time to time.
2. 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.
3. If the student has already passed any course(s) of readmitted program in the earlier regulation / semester of study, such courses are exempted.
4. The courses that are not done in the earlier regulations / semester as compared need to be cleared after readmission by appearing for the examinations conducted time to time under the new regulations.
5. In general, after transition, course composition and number of credits / semester shall be balanced between old and new regulations on case to case basis.
6. In case, the students who do not have option of acquiring required credits with the existing courses offered as per the new curriculum under autonomy, credit balance can be achieved by clearing the additional courses offered. The additional courses that are offered can be of theory or laboratory courses.

26. REVISION OF REGULATIONS AND CURRICULUM

The Institute from time to time may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

27. FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT AUTONOMY

1. **Who grants Autonomy? UGC, Govt., AICTE or University**

   In case of colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy but only after concurrence from the respective state Government as well as UGC. The State Government has its own powers to grant autonomy directly to Govt. and Govt. aided Colleges.

2. **Shall GIET award its own Degrees?**

   No. Degree will be awarded by Jawaharlal Nehru Technological University, Hyderabad with a mention of the name GIET on the Degree Certificate.

3. **What is the difference between a Deemed University and an Autonomy College?**

   A Deemed University is fully autonomous to the extent of awarding its own Degree. A Deemed University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4. **How will the Foreign Universities or other stake - holders know that we are an Autonomous College?**

   Autonomous status, once declared, shall be accepted by all the stake holders. The Govt. of Telangana mentions autonomous status during the First Year admission procedure. Foreign Universities and Indian Industries will know our status through our website.

5. **What is the change of Status for Students and Teachers if we become Autonomous?**

   An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic performances, our capability of self- governance and the kind of quality education we offer.

6. **Who will check whether the academic standard is maintained/ improved after Autonomy? How will it be checked?**

   There is a built-in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Program Evaluation Committee, which will keep a watch on the academics and keep its reports and recommendations every year. In addition, the highest academic council also supervises the academic matters. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7. **Will the students of GIET as an Autonomous College qualify for University Medals and Prizes for academic excellence?**

   No. GIET has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural on co-curricular organized by the University the students shall qualify.

8. **Can GIET have its own Convocation?**

   No. Since the University awards the degree the convocation will be that of the University, but there will be Graduation Day at GIET.

9. **Can GIET give a provisional degree certificate?**
   Since the examinations are conducted by GIET and the results are also declared by GIET, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the affiliating university. Therefore with the prior permission of the university the institute will be entitled to give the provisional certificate.

10. **Will Academic Autonomy make a positive impact on the Placements or Employability?**
    Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.
11. **What is the proportion of internal and External Assessment as an Autonomous College?**
    Presently, it is 60% external and 40% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.
12. **Is it possible to have complete Internal Assessment for Theory or Practicals?**
    Yes indeed. We define our own system. We have the freedom to keep the proportion of external and internal assessment component to choose.
13. **Why Credit based Grade System?**
    The credit based grade system is an accepted standard of academic performance the world over in all Universities. The acceptability of our graduates in the world market shall improve.
14. **What exactly is a Credit based Grade System?**
    The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Leaming process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like A, B,C,D, etc. are assigned for a Range of Marks. (e.g. 91% and above is A+, 80 to 90 % could be A etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance
15. **What are the norms for the number of Credits per Semester and total number of Credits for UG/PG program?**
    These norms are usually defined by UGC or AICTE. Usually around 25 Credits per semester is the accepted norm.

16. **What is a Semester Grade Point Average (SGPA)?**
    The performance of a student in a semester is indicated by a number called SGPA. The SGPA is the weighted average of the grade points obtained in all the courses registered by the student during the semester.

$$SGPA = \sum_{i=1}^{n} (C_i \quad G_i \ ) \ / \ \sum_{i=1}^{n} C_i$$

    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 and i represent the number of courses in which a student registered in the concerned semester. SGPA is rounded to two decimal places.

17. **What is a Cumulative Grade Point Average (CGPA)?**

An up-to-date assessment of overall performance of a student from the time of his first registration is obtained by calculating a number called CGPA, which is weighted average of the grade points obtained in all the courses registered by the students since he entered the Institute.

$$CGPA = \sum_{j=1}^{m} (C_j \quad G_j \ ) / \sum_{j=1}^{m} C_j$$

Where, S_j is the SGPA of the j^{th} semester and C_j is the total number of credits upto the semester and m represent the number of semesters completed in which a student registered upto the semester. CGPA is rounded to two decimal places.

18. **Is there any Software available for calculating Grade point averages and converting the same into Grades?**
Yes, the institute has its own **ERP** software for calculation of SGPA, CGPA, etc.

19. **Will the teacher be required to do the job of calculating SGPAs etc. and convert the same into Grades?**
No. The teacher has to give marks obtained out of whatever maximum marks as it is. Rest is all done by the computer.

20. **Will there be any Revaluation or Re-Examination System?**
Yes. There will be revaluation if the examinee is not satisfied with the marks secured in the examination.

21. **How fast Syllabi can be and should be changed?**
Autonomy allows us the freedom to change the syllabi as often as we need.

22. **Will the Degree be awarded on the basis of only final year performance?**
No. The CGPA will reflect the average performance of all the semester taken together.

23. **What are Statutory Academic Bodies?**
Governing Body, Academic Council, Examination Committee and Board of Studies are the different statutory bodies. The participation of external members in everybody is compulsory. The institute has nominated professors from University (the officers of the rank of Pro-vice Chancellor, Deans and Controller of Examinations) and also the reputed industrialist and industry experts on these bodies.

24. **Who takes Decisions on Academic matters?**
The Governing Body of institute is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like Boards of Studies. Decisions taken at the Board of Studies level are to be ratified at the Academic Council and Governing Body.

25. **What is the role of Examination committee?**
The Examinations Committee is responsible for the smooth conduct of internal, End Semester and make up Examinations if any. All matters involving the conduct of examinations spot valuations, tabulations preparation of Grade Sheet etc fall within the duties of the Examination Committee.

26. **Is there any mechanism for Grievance Redressal?**

The institute has grievance redressal committee, headed by the Principal and Convenors as Dean - Student affairs and Dean - AAR & NPTEL & IQAC.

27. **How many attempts are permitted for obtaining a Degree?**

All such matters are defined in Rules & Regulation.

28. **Who declares the result?**

The result declaration process is also defined. After tabulation work wherein the SGPA, CGPA and final Grades are ready, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the Examinations and Result Committee for its approval. The result is then declared on the institute notice boards as well put on the web site and Students Corner. It is eventually sent to the University.

29. **Who will keep the Student Academic Records, University or GIET?**

It is the responsibility of the Examination Control Office of the institute to keep and preserve all the records.

30. **What is our relationship with the JNT University?**

We remain an affiliated college of the JNT University. The University has the right to nominate its members on the academic bodies of the college.

31. **Shall we require University approval if we want to start any New Courses?**

Yes, it is expected that approvals or such other matters from an autonomous college will receive priority.

32. **Shall we get autonomy for PG and Doctoral Programs also?**

Yes, presently our PG programs also enjoying autonomous status.

28. MALPRACTICE RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices / Improper conduct	Punishment
	if the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculator, cell phone, pager, palm computer or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is course to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that

		semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is course to the academic regulations i n connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6.	Refuses to obey the orders of the Controller of Examinations /Additional Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the COE or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the COE or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the Institute premises or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is course to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college	Student of the colleges expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including

	indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Academic Council of GIET(A) for further action to award suitable punishment.	

FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

GLOBAL INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
COURSE CATALOGUE
REGULATIONS B.TECH – GR - 24
COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
I SEMESTER

Course Code	Course Name	Subject Area	Category	Periods Per Week			Credits	Scheme of Examination Max Marks		
				L	T	P		CIA	SEE	Total
INDUCTION PROGRAM										
THEORY										
MA101BS	Matrices and Calculus	BSC	Foundation	3	1	0	4	40	60	100
PH102BS	Applied Physics	BSC	Foundation	3	1	0	4	40	60	100
EC103ES	Basic Electrical and Electronics Engineering	ESC	Foundation	2	1	0	3	40	60	100
CS104ES	Problem Solving through C	ESC	Foundation	3	0	0	3	40	60	100
PRACTICAL										
PH105BS	Applied Physics Lab	BSC	Foundation	0	0	2	1	40	60	100
EC106ES	Basic Electrical and Electronics Engineering Lab	ESC	Foundation	0	0	2	1	40	60	100
CS107ES	Problem Solving through C Lab	ESC	Foundation	0	1	3	2	40	60	100
CS108ES	Python Programming Lab	ESC	Foundation	0	0	2	1	40	60	100
ME109ES	Engineering Workshop	ESC	Foundation	0	0	2	1	40	60	100
MANDATORY COURSE										
*MC110	Environmental Science	MC	MC - I	Ref: Academic Regulations B.Tech GR 24						
Total Credits				**20**						

COURSE CONTENT

Matrices and Calculus								
I Semester: Common to All Branches								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
MA101BS	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**1**	**-**	**4**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil				**Total Classes: 64**		
Prerequisite: Mathematical Knowledge at the pre-university level								

1. COURSE OVERVIEW

This course Matrices and Calculus is a foundation course of mathematics for all engineering branches. The concepts of Matrices, Eigen Values, Eigen Vectors, Functions of Single and Several Variables, Fourier Series and Multiple Integrals. This course is applicable for simulations, colour imaging process, finding optimal solutions in all fields of industries.

2. COURSE OBJECTIVE

The students will try to Learn:

1. Types of matrices and their properties.
2. The concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form.
4. A geometrical approach to the mean value theorems and their application to the mathematical problems.
5. Evaluation of surface areas and volumes of revolutions of curves.
6. Evaluation of improper integrals using Beta and Gamma functions.
7. Partial differentiation, the concept of total derivative.
8. Finding maxima and minima of a function of two and three variables.
9. Evaluation of multiple integrals and their applications.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Write the matrix representation of a set of linear equations and analyse the solution of the system of equations.
CO 2	Find the Eigen Values and Eigenvectors. Reduce the quadratic form to canonical form using orthogonal transformations. To do verification and Application of Cayley Hamilton Theorem.
CO 3	Solve the applications on the mean value theorems. Evaluate the improper integrals using Beta and Gamma functions.
CO 4	Find the extreme values of functions of two variables with / without constraints and to apply Lagrange's Multipliers.
CO 5	Evaluate the multiple integrals, change the order and apply the concept to find areas, volumes.

4. COURSE CONTENT

UNIT - I: Matrices **10 L**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by the Gauss elimination method.

UNIT - II: Eigen values and Eigen vectors **10 L**

Linear Transformation and Orthogonal Transformation: Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT - III: Calculus **10 L**

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their geometric interpretation and applications, Cauchy's Mean value Theorem, and Taylor's Series (Maclaurin's Series).
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta, Gamma functions and their applications.

UNIT - IV: Multivariable Calculus (Partial Differentiation and applications) **10 L**

Definitions of Limit and continuity and Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using the method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration) **8 L**

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

5. Text books

i. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
ii. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

6. Suggested Readings.

i. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
ii. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
iii. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications,
iv. Reprint, 2008.
v. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

CO-PO-PSO Mapping

	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
CO 1	**3**	**2**										**2**	**3**	**2**
CO 2	**2**	**3**										**2**	**2**	**3**
CO 3	**2**	**3**											**2**	**3**
CO 4	**3**	**-**	**1**		**2**								**3**	**-**
CO 5	**3**	**3**			**1**							**2**	**3**	**3**

COURSE CONTENT

APPLIED PHYSICS								
I Semester: CE, ME, ECE, CSM, CSD **II Semester: CSE**								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
PH102BS	**FOUNDATION**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**1**	**-**	**4**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil				**Total Classes: 64**		
Prerequisite: Basic principles of physics								

1. COURSE OVER VIEW

Applied Physics**,** is designed to explain the fundamental concepts and basic principles in the subject. A step-by-step build-up of the concepts makes this book student-friendly. The structure of each chapter redefines the parameters of conceptual learning through solved examples, theoretical questions, and objective questions. Conceptual arguments lead to the mathematical formulae providing a coherent mix of Physics and Mathematics.

2. COURSE OBJECTIVE

The students will try to Learn:

i. Understand the basic principles of quantum physics and band theory of solids.

ii. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.

iii. Study the fundamental concepts related to the dielectric, magnetic and energy materials.

iv. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.

v. Study the characteristics of lasers and optical fibres.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
CO 2	Identify the role of semiconductor devices in science and engineering Applications.
CO 3	Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
CO 4	Appreciate the features and applications of Nano materials.
CO 5	Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

4. COURSE CONTENT

UNIT - I

QUANTUM MECHANICS: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box. Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT - II

SEMICONDUCTORS AND DEVICES: Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT - III

DIELECTRIC, MAGNETIC AND ENERGY MATERIALS: Dielectric Materials: Basic definitions-types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators. Magnetic Materials: Hysteresis - soft and hard magnetic materials - magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics. Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

UNIT - IV

NANOTECHNOLOGY: Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.

UNIT - V

LASER AND FIBER OPTICS: Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations lasing action - pumping methods- ruby laser, He-Ne laser, CO2 laser, Argon ion Laser, Nd: YAG laser, semiconductor laser-applications of laser. Fiber Optics: Introduction to optical fiber- advantages of **Optical Fibers:** - total internal reflection, construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers, losses in optical fiber - optical fiber for communication system - applications.

5. TEXT BOOKS

i. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.

ii. K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition,2022.

6. REFERENCE BOOKS

i. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.

ii. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.

iii. A.K. Bhandhopadhya - Nano Materials, New Age International, 1st Edition, 2007.

CO-PO-PSO Mapping

	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
CO 1	**2**													**2**
CO 2	**1**		**3**				**2**							
CO 3	**1**				**3**									**2**
CO 4	**3**				**2**									
CO 5	**3**	**2**												

COURSE CONTENT

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING								
I Semester: CSE (AIML), CSE(DS) **II Semester: CSE**								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC103ES	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	**1**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 32	Tutorial Classes: 16	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Nil								

1. COURSE OVER VIEW:

This course enables knowledge on electrical quantities such as current, voltage, and power, energy to know the impact of technology in global and societal context. It provides the knowledge on basic DC and AC circuits used in electrical and electronic devices, highlights the importance of electrical machines and basics of semiconductor devices like diodes and transistors.

2. COURSE OBJECTIVE

The students will try to Learn:

i. The fundamentals of electrical circuits and analysis of circuits with DC and AC excitation using circuit laws.

ii. The construction and operation of Electrical machines.

iii. The operational characteristics of semiconductor devices with their applications.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Make use of basic electrical laws for solving DC and AC circuits.
CO 2	Apply network theorems for analysis of simple electrical circuits.
CO 3	Demonstrate the fundamentals of electromagnetism for the operation of DC and AC machines.
CO 4	Utilize the characteristics of semiconductor devices for the application of rectifiers and regulators.
CO 5	Interpret the transistor configurations for optimization of the operating point.
CO 6	Understand the amplifier circuits using transistors for calculating different parameters.

4. COURRSE CONTENT

UNIT-I:

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-II:

Electrical Installations: Components of LT Switch-gear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB,

Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

UNIT-III:

Electrical Machines: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

UNIT-IV:

P-N Junction and Zener Diode: Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

Rectifiers and Filters: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L-section Filters, π- section Filters.

UNIT-V:

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

5. TEXT BOOKS

i. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University.
ii. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education.

6. REFERENCE BOOKS

i. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
ii. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
iii. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
iv. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.

v. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
vi. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
vii. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
viii. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
ix. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

7. ELECTRONIC RESOURCES

- https://www.kuet.ac.bd/webportal/ppmv2/uploads/1364120248DC%20Machines
- https://www.eleccompengineering.files.wordpress.com/2014/08/a-textbook-of-electrical-technologyvolume-ii-ac-and-dc-machines-b-l-thferaja.pdf
- https://www.geosci.uchicago.edu/~moyer/GEOS24705/Readings/Klempner_Ch1.pdf
- https://www.ibiblio.org/kuphaldt/electricCircuits/DC/DC.pdf
- https://www.users.ece.cmu.edu/~dwg/personal/sample.pdf.

CO-PO-PSO Mapping

	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
CO 1	**3**	**3**	**1**	**1**	**0**	**2**	**1**	**1**	**0**	**0**	**1**	**1**	**2**	**2**
CO 2	**3**	**3**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**2**	**3**	**2**	**2**
CO 3	**3**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**3**	**2**	**2**	**2**
CO 4	**3**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**3**	**2**	**2**	**2**
CO 5	**3**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**3**	**2**	**2**	**2**

COURSE CONTENT

PROBLEM SOLVING THROUGH C PROGRAMMING								
I Semester: CSE, CSM, CSD, ECE, CE, ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
CS104ES	**FOUNDATION**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: There are no prerequisites to take this course								

1. COURSE OVER VIEW

This course is designed to introduce B.Tech first-year students to fundamental programming concepts using the C language. It aims to build a strong foundation in computer science through essential programming techniques and problem-solving strategies.

2. COURSE OBJECTIVE

The students will try to Learn:

i. To learn the fundamentals of computers.
ii. To understand the various steps in program development.
iii. To learn the syntax and semantics of the C programming language.
iv. To learn the usage of structured programming approaches in solving problems.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Develop simple applications in C using basic constructs.
CO 2	Design and implement applications in C using Arrays and Strings.
CO 3	Design applications using sequential and random-access file processing.
CO 4	Design and implement applications in C using Functions and Pointers.
CO 5	Design and implement applications in C using Sorting and Searching.

4. COURSE CONTENT

UNIT-I: Introduction to Programming **10L**

- **Compilers:** Compiling and executing a program.
- **Representation of Algorithm:** Algorithms for finding roots of quadratic equations, finding minimum and maximum numbers of a given set, checking if a number is prime. Flowchart / Pseudocode with examples, Program design, and structured programming.
- **Introduction to C Programming Language:** Variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static, and register), type conversion, The main method and command line arguments, Bitwise operations: Bitwise AND, OR, XOR, and NOT operators.
- **Conditional Branching and Loops:** Writing and evaluation of conditionals and consequent branching with it, if-else, switch-case, ternary operator, go to. Iteration with for, while, do-while loops.
- **I/O:** Simple input and output with scan f and printf, formatted I/O, Introduction to stdin, std out, and stderr. Command line arguments.

UNIT - II: Arrays, Strings, Structures, and Pointers: 10L

- **Arrays:** One and two-dimensional arrays, creating, accessing, and manipulating elements of arrays.
- **Strings:** Introduction to strings, handling strings as an array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings.
- **Structures:** Defining structures, initializing structures, unions, Array of structures.
- **Pointers:** Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked lists (no implementation), Enumeration data type.

UNIT - III: Preprocessor and File Handling in C: 10L

- **Preprocessor:** Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef.
- **Files:** Text and Binary files, Creating, Reading, and Writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell, and rewind functions.

UNIT - IV: Function and Dynamic Memory Allocation: 10L

- **Functions:** Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, Passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries.
- **Recursion:** Simple programs such as Finding Factorial, Fibonacci series, etc., Limitations of Recursive functions.
- **Dynamic Memory Allocation:** Allocating and freeing memory, Allocating memory for arrays of different data types.

UNIT - V: Searching and Sorting: 8L

- **Basic Searching:** Basic searching in an array of elements (linear and binary search techniques).
- **Basic Sorting Algorithms:** Basic algorithms to sort an array of elements (Bubble, Insertion, and Selection sort algorithms).
- **Order of Complexity:** Basic concept through example programs.

5. TEXT BOOKS

i. Jeri R. Hanly and Elliot B.Koffman, *Problem Solving and Program Design in C*, 7th Edition, Pearson.
ii. B.A. Forouzan and R.F. Gilberg, *C Programming and Data Structures*, Cengage Learning, 3rd Edition.

6. REFERENCE BOOKS

i. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice Hall of India.
ii. E. Balagurusamy, *Computer Fundamentals and C*, 2nd Edition, McGraw-Hill.
iii. Yashavant Kanetkar, *Let Us C*, 18th Edition, BPB.
iv. R.G. Dromey, *How to Solve It by Computer*, Pearson, 16th Impression.
v. Stephen G. Kochan, *Programming in C*, 4th Edition, Pearson Education.
vi. Herbert Schildt, *C: The Complete Reference*, McGraw Hill, 4th Edition.
vii. Byron Gottfried, *Schaum's Outline of Programming with C*, McGraw-Hill.

CO-PO-PSO Mapping

	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
CO 1	3	3										2	3	
CO 2	3	2	3		1								3	
CO 3	3	3	2		1								2	
CO 4	2	3			1								2	
CO 5	3	3	1		1								2	

COURSE CONTENT

APPLIED PHYSICS LABORATORY								
I Semester: CE, ME, ECE, CSM, CSD **II Semester: CSE**								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
PH105BS	**FOUNDATION**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes:	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite: Basic Principles of Physics								

1. COURSE OVER VIEW

This course is designed to introduce B.Tech first-year students to fundamental programming concepts using the C language. It aims to build a strong foundation in computer science through essential programming techniques and problem-solving strategies.

2. COURSE OBJECTIVE

The students will try to Learn:

1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
CO 2	Appreciate quantum physics in semiconductor devices and optoelectronics.
CO 3	Gain the knowledge of applications of dielectric constant.
CO 4	Understand the variation of magnetic field and behavior of hysteresis curve.
CO 5	Carried out data analysis.

4. COURSE CONTENT

LIST OF EXPERIMENTS:

1. Understanding the method of least squares – torsional pendulum as an example.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE, CB & CC configurations).
6. a) V-I and L-I characteristics of light emitting diode (LED).
   b) V-I Characteristics of solar cell.
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.

9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material.
11. a) Determination of the beam divergence of the given LASER beam.
    b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
12. Determination of work function and Planck's constant using photoelectric effect.

Note: Any 8 experiments are to be performed.

5. REFERENCE BOOK

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

CO-PO-PSO Mapping

	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
CO 1	**3**	**2**	**2**		**2**	**1**			**1**			**1**	**2**	**1**
CO 2	**2**			**1**					**1**			**1**	**2**	**1**
CO 3		**2**	**3**		**3**	**1**			**3**			**1**	**2**	**1**
CO 4	**3**	**2**	**2**		**2**	**1**			**1**			**1**	**2**	**1**
CO 5	**1**	**1**							**1**			**1**		**1**

COURSE CONTENT

BASICS ELECTRICAL AND ELECTRONICS ENGINEERING LAB								
I Semester: CSE (AI&ML) /CSE(DS) **II Semester: CSE**								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC106ES	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite:								

1. COURSE OVERVIEW:

This course serves as a foundation course on electrical engineering. It covers a broad range of fundamental electrical circuits and devices. The concepts of current, voltage, power, basic circuit elements, electrical and electronic devices and their application in more complex electrical systems are to be imparted to the students.

2. COURSE OBJECTIVES:

- To introduce the concepts of electrical circuits and its components.
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits.
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

3. COURSE OUTCOMES:

CO 1	To analyze and solve electrical circuits using network laws and theorems.
CO 2	To understand and analyze basic Electric and Magnetic circuits
CO 3	To study the working principles of Electrical Machines
CO 4	To introduce components of Low Voltage Electrical Installations
CO 5	To identify and characterize diodes and various types of transistors.

4. LIST OF EXPERIMENTS / DEMONSTRATIONS:

PART- A: ELECTRICAL

1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
   (ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star) in a Three Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART-B: ELECTRONICS

1. Study and operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input & Output characteristics of Transistor in CB / CE configuration
5. Full Wave Rectifier with & without filters
6. Input and Output characteristics of FET in CS configuration

5. TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University.
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education.

6. REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

7. ELECTRONICS RESOURCES:

i. https://www.nptel.ac.in/Courses/117106108
ii. https://www.gnindia.dronacharya.info/EEEDept/labmanuals.html
iii. https://www.textofvideo.nptel.iitm.ac.in
iv. https://www.textofvideo.nptel.iitm.ac.in/

8. MATERIALS ONLINE:

Course template
Lab manual

CO-PO-PSO Mapping

	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
CO 1	**3**	**3**	**1**	**1**	**0**	**2**	**1**	**1**	**0**	**0**	**1**	**1**	**2**	**2**
CO 2	**3**	**3**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**2**	**3**	**2**	**2**
CO 3	**3**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**3**	**2**	**2**	**2**
CO 4	**3**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**3**	**2**	**2**	**2**
CO 5	**3**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**0**	**0**	**3**	**2**	**2**	**2**

COURSE CONTENT

PROBLEM SOLVING THROUGH C LAB								
I Semester: CSE, CSM, CSD, ECE, CE, ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
CS107ES	**FOUNDATION**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**1**	**3**	**2**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: 16	Practical Classes: 48				**Total Classes: 64**		
Prerequisite:								

1. COURSE OVER VIEW

The Programming for Problem Solving Laboratory for B.Tech. I Year I Sem focuses on foundational programming skills using C. Students learn to create, debug, and execute programs using an IDE, addressing various numeric and algorithmic problems. The course emphasizes the use of arrays, pointers, functions, and file operations to develop modular and efficient code. It also covers string manipulations, sorting, and searching algorithms. The lab sessions provide practical experience in problem-solving and code optimization.

2. COURSE OBJECTIVE

The students will try to Learn:

- To work with an IDE to create, edit, compile, run, and debug programs.
- To analyze various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C, such as operators and control statements.
- To develop modular, reusable, and readable C programs using concepts like functions and arrays.
- To write programs using dynamic memory allocation concepts.
- To create, read from, and write to text and binary files.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to

CO 1	Develop and debug C programs using an IDE.
CO 2	Solve basic numeric and algorithmic problems with C
CO 3	Implement and manage arrays, pointers, and functions in C.
CO 4	Handle file operations in C for reading, writing, and processing.
CO 5	Perform string manipulations and various sorting/searching algorithms.

4. COURSE CONTENT

Practice Sessions:

Basics:

- Write a program that prints the results of all operators available in C (including pre/post increment, bitwise AND/OR/NOT, etc.). Read required operand values from standard input.
- Write a program that converts one data type to another using auto conversion and casting. Take the values from standard input.

Simple Numeric Problems:

- Find the maximum and minimum of three numbers.
- Calculate simple and compound interest.

- Determine the class awarded based on percentage marks:
  - < 40% = Failed
  - 40% to < 60% = Second class
  - 60% to < 70% = First class
  - < 70% = Distinction
- Print a multiplication table for a given number and the number of rows.
- Show the binary equivalent of a positive number between 0 and 255.

Expression Evaluation:

- Calculate the time taken by a ball to reach each floor of a 10-floor building using the formula s=ut+12at2s = ut + \frac{1}{2}at^2s=ut+21at2.
- Write a program to perform operations (+, -, *, /, %) based on user input and print the result using a switch statement.
- Determine if a given number is prime.
- Find the sum of individual digits of a positive integer and check if the number is a palindrome.
- Generate the first nnn terms of the Fibonacci sequence.
- Generate all prime numbers between 1 and nnn, where nnn is supplied by the user.
- Find the roots of a quadratic equation.
- Calculate the expression 1−x2+x24−x361 - \frac{x}{2} + \frac{x^2}{4} - \frac{x^3}{6}1−2x+4x2−6x3.
- Compute the sum of the geometric progression 1+x+x2+x3+…+xn1 + x + x^2 + x^3 + \ldots + x^n1+x+x2+x3+…+xn.

Arrays, Pointers, and Functions:

- Find the minimum, maximum, and average in an array of integers.
- Write functions to compute mean, variance, standard deviation, and sort nnn elements in a one-dimensional array.
- Perform matrix operations using functions:
  - Addition
  - Multiplication
  - Transpose (dynamically allocated matrix)
- Implement both recursive and non-recursive functions:
  - Factorial of a given integer
  - Greatest Common Divisor (GCD) of two integers
  - Power xnx^nxn
- Use pointers to:
  - Read elements into an array and display values
  - Display values in reverse order
  - Calculate the sum of nnn elements from an array

Files:

- Display the contents of a file to the standard output device.
- Copy one file to another, replacing all lowercase characters with uppercase equivalents.
- Count occurrences of a character in a text file (filename and character are command line arguments).
- Create a binary file to store 10 integers. Modify a value at a specified index, then read and print all values.
- Merge two files into a third file.

Strings:

- Convert a Roman numeral (I to L) to its decimal equivalent.
- Convert a number (1 to 50) to its Roman equivalent.
- Perform operations using functions:
  - Insert a substring into a given main string at a specified position.
  - Delete nnn characters from a given position in a string.

- Determine if a string is a palindrome.
- Display the position of a character in a string or -1 if not found.
- Count lines, words, and characters in a text.

Miscellaneous:

- Write a menu-driven program to:
    - Enter nnn numbers and choose between finding the smallest, largest, sum, or average. Use functions and a switch statement.
- Construct a number pyramid with different patterns.

Sorting and Searching:

- Implement linear search in an unsorted list using a non-recursive function.
- Implement binary search in a sorted list using a non-recursive function.
- Implement Bubble Sort to sort integers in ascending order.
- Implement Selection Sort to sort integers in descending order.
- Implement Insertion Sort to sort integers in ascending order.
- Sort an array of names.

5. TEXT BOOKS

i. Jeri R. Hanly and Elliot B.Koffman, *Problem Solving and Program Design in C*, 7th Edition, Pearson.
ii. B.A. Forouzan and R.F. Gilberg, *C Programming and Data Structures*, Cengage Learning, 3rd Edition.

6. REFERENCE BOOKS

i. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice Hall of India.
ii. E. Balagurusamy, *Computer Fundamentals and C*, 2nd Edition, McGraw-Hill.
iii. Yashavant Kanetkar, *Let Us C*, 18th Edition, BPB.
iv. R.G. Dromey, *How to Solve It by Computer*, Pearson, 16th Impression.
v. Stephen G. Kochan, *Programming in C*, 4th Edition, Pearson Education.
vi. Herbert Schildt, *C: The Complete Reference*, McGraw Hill, 4th Edition.
vii. Byron Gottfried, *Schaum's Outline of Programming with C*, McGraw-Hill.

7. ELECTRONIC RESOURCES

i. https://codelite.org/
ii. http://www.codeblocks.org/
iii. http://www.bloodshed.net/devcpp
iv. http://www.eclipse.org

CO-PO-PSO Mapping

	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
CO 1	**3**						**3**					**3**		
CO 2		**3**	**3**	**2**										
CO 3				**3**		**3**	**3**		**3**					**3**
CO 4			**3**		**3**						**3**			**3**
CO 5						**3**				**3**	**3**	**3**		**3**

COURSE CONTENT

PYTHON PROGRAMMING LABORATORY								
I Semester: CSM, CSD, ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
CS108ES	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite:								

1. COURSE OVER VIEW

The course focuses on practical Python programming skills through a series of progressively challenging tasks. In the initial weeks, students get familiar with Python basics, including using the interpreter, writing simple programs, and understanding basic functions. As the course advances, students work on more complex problems like matrix operations, file handling, and implementing algorithms. They also explore object-oriented programming concepts, exception handling, and basic GUI development. The course culminates with applications in numerical computing and digital logic, preparing students for real-world problem-solving scenarios.

2. COURSE OBJECTIVE

The students will try to Learn:

1. The implications of disruption and the role of innovation.
2. The various frameworks, tools, and techniques of design thinking.
3. How to design, develop, and implement an innovation product or service or process.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Develop the application specific codes using python.
CO 2	Understand Strings, Lists, Tuples and Dictionaries in Python.
CO 3	Verify programs using modular approach.
CO 4	Verify programs using file I/O, Python standard library.
CO 5	Implement Digital Systems using Python.

4. COURRSE CONTENT

Week -1:

1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
ii) Start the Python interpreter and type help () to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3.i) Write a program to calculate compound interest when principal, rate and number of periods are given.
ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points.
4. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:

1. Print the below triangle using for loop.

```
5
4 4
3 3 3
2 2 2 2
1 1 1 1 1
```

2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder).
3. Python Program to Print the Fibonacci sequence using while loop.
4. Python program to print all prime numbers in a given interval (use break).

Week - 3:

1. i) Write a program to convert a list and tuple into arrays.
   ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week - 4:

1. Write a function called is sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. Write a function called has duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

i). Write a function called remove duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.

ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.

iii). Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'

ii) Remove the given word in all the places in a string?

iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

4. Writes a recursive function that generates all binary strings of n-bit length.

Week - 5:

1. i) Write a python program that defines a matrix and prints.

ii) Write a python program to perform addition of two square matrices.

iii) Write a python program to perform multiplication of two square matrices.

2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
3. Use the structure of exception handling all general purpose exceptions.

Week-6:

1. a. Write a function called draw rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

b. Add an attribute named color to your Rectangle objects and modify draw rectangle so that it uses the color attribute as the fill color.

c. Write a function called draw point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw circle that draws circles on the canvas.

2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.

3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

Week- 7:

1. Write a Python code to merge two given file contents into a third file.

2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

3. Write a Python code to Read text from a text file, find the word with most number of occurrences.

4. Write a function that reads a file file1 and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.

2. a) Install NumPy package with pip and explore it.

3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR

4. Write a program to implement Half Adder, Full Adder, and Parallel Adder.

5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

5. TEXT BOOKS

i. Supercharged Python: Take your code to the next level, Overland.

ii. Learning Python, Mark Lutz, O'reilly.

6. REFERENCE BOOKS

i. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

ii. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson.

iii. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition.

iv. Think Python, Allen Downey, Green Tea Press.

v. Core Python Programming, W. Chun, Pearson.

vi. Introduction to Python, Kenneth A. Lambert, Cengage.

7. ELECTRONIC RESOURCES

i. Python Interpreter - https://www.python.org/

ii. https://www.python.org/downloads/release/python-3110/

CO-PO-PSO Mapping

	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
CO 1	**3**						**3**					**3**		
CO 2		**3**	**3**	**2**										
CO 3				**3**		**3**	**3**		**3**					**3**
CO 4			**3**		**3**						**3**			**3**
CO 5						**3**				**3**	**3**	**3**		**3**

COURSE CONTENT

ENGINEERING WORKSHOP								
I Semester: CSM, CSD, ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ME109ES	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite:								

1. COURSE OVER VIEW

To develop a skill in dignity of labour, precision, safety at work place, team working and development of right attitude. Ability to design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint.

2. COURSE OBJECTIVES:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at workplace.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

3. COURSE OUTCOMES:

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

CO 1	Study and practice on machine tools and their operations.
CO 2	Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
CO 3	Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiselling.
CO 4	Apply basic electrical engineering knowledge for house wiring practice.

4. TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
II. Fitting – (V-Fit, Dovetail Fit &Semi-circular fit)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V. Welding Practice – (Arc Welding & Gas Welding)
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

5. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working and CNC Lathe turning.

6. TEXT BOOKS:

1. Workshop Practice /B.L.Juneja / Cengage.
2. Workshop Manual / K.Venugopal / Anuradha.

7. REFERENCE BOOKS:

1. Workshop Manual-P.Kannaiah / K.L.Narayana / Scitech.
2. Workshop Manual / Venkat Reddy/BSP.

CO-PO-PSO Mapping

	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
CO 1	**3**	**3**	**3**	**1**		**1**		**1**	**1**			**1**	**3**	**2**
CO 2	**3**	**3**	**3**	**1**		**1**		**1**	**1**			**1**	**3**	**2**
CO 3	**3**	**3**	**3**	**1**		**1**		**1**	**1**			**1**	**3**	**2**
CO 4	**3**	**3**	**3**	**1**		**1**		**1**	**1**			**1**	**3**	**2**

COURSE CONTENT

ENVIRONMENTAL SCIENCE								
I Semester: ME / CE / ECE / CSE (AI & ML) / CSE / CSE (DS)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
MC110	**Foundation**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	-	-	-	-	-
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: Nil**		
Prerequisite: Basic Principles of earth science.								

1. COURSE OVER VIEW

This course is an interdisciplinary study which examines the interaction between humans and the environment, with specific reference to the effects of modern technological advances. The students will be able to understand the sustainable development, ecological sustainability, environmental pollution, environmental issues in order to protect the environment and followed by the application of this knowledge to current environmental problems in the later years.

2. COURSE OBJECTIVES:

The students will try to Learn:

i. The interrelationship between living organism and environment.
ii. The importance of environment by assessing its impact on the human world.
iii. The knowledge on themes of biodiversity, natural resources, pollution control and waste management.
iv. The sustainability and unsustainability of various interactions between human society and the earth's natural systems.

3. COURSE OUTCOMES

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

CO 1	Infer the basic ecological principles, biogeochemical cycles and its function for the flow of energy in ecosystem.
CO 2	Understand the natural resources and their conservation for sustainable development.
CO 3	Predict the importance of biodiversity for its productive use.
CO 4	Identify the global environmental problems and study the role of international summits for minimizing impact.
CO 5	Outline the features of laws and rules related to environment protection,environmental impact assessment towards sustainable development.

4. SYLLABUS:

MODULE–I: ECOSYSTEMS

Environment: definition, scope and importance of ecosystem, classification, structure and function of an ecosystem, food chains, food webs and ecological pyramids, flow of energy; biogeochemical cycles, hydrological cycle, phosphorous cycle, nitrogen cycle, biomagnifications.

MODULE-II: NATURAL RESOURCES

Natural resources: classification of resources, living and non-living resources; water resources: use and over utilization of surface and ground water, floods and droughts, dams, benefits and problems; mineral resources: use and exploitation, environmental effects of extracting and using mineral resources; land resources; energy resources: renewable and non-renewable energy sources, use of alternate energy source.

MODULE-III: BIODIVERSITY AND BIOTIC RESOURCES

Biodiversity and biotic resources: introduction, definition, genetic, species and ecosystem diversity; value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values; Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, human-wildlife conflicts; Conservation of biodiversity: In situ and ex situ conservation.

MODULE–IV: ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES

Environmental pollution: definition, causes, effects and control measures of air pollution, water pollution, soil pollution, impacts of modern agriculture and noise pollution; solid waste: municipal solid waste management, composition and characteristics of e-waste and its management; Pollution control technologies: waste water treatment methods, primary, secondary and tertiary; global environmental issues and global efforts: climate change and impacts on human environment, ozone depletion, ozone depleting substances; International conventions / protocols: Kyoto protocol and Montreal protocol.

MODULE–V: ENVIRONMENTAL POLICY AND LEGISLATION

Environmental legislations: environmental protection act, air act1981, water act, forest act. municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules, population and its explosion.

5. TEXT BOOKS:

i. Erach Bharucha, *Text Book of Environmental Studies for Under Graduate Course*, Orient Black Swan, 3rdEdition, 2021.

ii. Anubha Kaushik and C P Kaushik, *Perspectives in Environmental Studies*, New Age International private limited, New Delhi,7th Edition, 2021.

iii. Benny Joseph, *Environmental Studies*, Tata Mc Graw Hill Publishing Co. Ltd, New Delhi, 3rd Edition, 2017.

6. REFERENCE BOOKS:

i. Dr. M Anji Reddy, *Text Book of Environmental Science and Technology*, BS Publications, 3rd Edition,2014.

ii. Y Anjaneyulu, *Introduction to Environmental Science*, BSP Books Private Limited, 3rd Edition, 2020.

7. ELECTRONICS RESOURCES:

i. https://www.meripustak.com/Environmental-Science-Isv-8th-Edition-121505
ii. https://www.meripustak.com&gclid=CjwKCAjwtp2bBhAGEiwAOZZTuFwLEkGc6SGNUZjXpz0ffeNwgBOHWQIKge-E-9UvXxTPxQJdjaTgJBoCrQIQAvD_BwE

8. MATERIALS ONLINE

1. Course Template
2. Tutorial Question Bank
3. Model Question Paper – I
4. Model Question Paper - II
5. Lecture Notes
6. Early Lecture Readiness Videos
7. Power Point Presentation