FACULTY OF ENGINEERING & ARCHITECTURE

MBM UNIVERSITY, JODHPUR

SYLLABUS

BACHELOR OF ENGINEERING

(SEMESTER SCHEME)

B.E. I Semester Examination 2024 (Session 2024-25)

B.E. II Semester Examination 2024 (Session 2024-25)

FACULTY OF ENGINEERING & ARCHITECTURE

MBM UNIVERSITY, JODHPUR

VISION OF THE INSTITUTION:

"To be a leading educational institute that provides quality technical education and conducts research to produce knowledge-rich professionals for meeting the dynamic needs of the industry and society."

MISSION OF THE INSTITUTION:

- To impart quality technical education to the students to make them globally competent engineers, contributing to the development of the nation and world at large.
- To imbibe ethical values, scientific and industrial temperament, and spirit of innovation among students.

BACHELOR OF ENGINEERING (SEMESTER SCHEME)
FOUR-YEAR INTEGRATED PROGRAMME

ACADEMIC REGULATIONS

1. INTRODUCTION

MBM University hereinafter referred to as the 'Institute' was founded as MBM Engineering College on 15th August 1951. This institute is one of the oldest technical institutions in the country which became a constituent faculty (Faculty of Engineering and Architecture) of the Jai Narain Vyas University, Jodhpur in the year 1962. Later, the Government of Rajasthan upgraded the institute to an independent, autonomous State University through a Legislative Act (MBM University Act 2021) in September 2021. Located on a 98-acre academic campus and situated within the 5 km. radius of all major landmarks of the Jodhpur City, the university is known for its vast campus and geographical advantage.

With a vision to cater to the growing needs of society and industry, the institute has always been a pioneer in incorporating the latest domains of engineering education and research. Currently, the institute offers 15 undergraduate, 25 postgraduate, and 10 doctoral research programs to aspiring students. Several factors including good infrastructure, cutting-edge curriculum, reputed faculties, low educational costs, and nourishing environment make MBM a first choice for students within Rajasthan as well as from other states across the country. The Institute aims to produce quality engineer-scientist having capabilities to address wide-ranging societal challenges and contribute towards advancement of science and technology. The University focuses on delivering high quality education and maintains high standards of education, prestigious legacy, and a flourishing environment that caters for the holistic and overall development of the students.

The university is proud of its large alumni base who have always excelled in their career and are contributing through top positions within industry, governmental bodies, and academia. Many of them are also working as professors in IITs, IIMs, and other prestigious technical institutions. The institute strives to maintain a culture and environment that enables our students to become responsible, ethical, and true professionals.

2. ADMISSION

MBM University offers undergraduate academic programme for students in different

disciplines. Admission to these programmes is through REAP (Rajasthan Engineering Admission Process), a coordination body for admission to B.E./B.Tech. /B. Arch. in Rajasthan. The Class XII pass-out students or Diploma in Engineering and Technology (10+3) can apply for admission. The diploma pass-out candidates can directly get admission to II year of B.E. programme in the appropriate discipline. They are required to apply through LEEP (Lateral Entry in Engineering Program), a body for centralized admission of Diploma pass-outs. The notification for admission is advertised in the month of June/July every year. The eligibility conditions and procedure are as laid down by University/State Government from time to time.

3. DURATION OF A PROGRAMME

The programme of study shall normally extend over a period of four years (eight semesters as an integrated programme). A student shall follow the prescribed courses as given in the teaching and examination scheme of the academic program to which he/she is admitted. The minimum duration of each academic program will be determined in terms of number of registered regular semester, hereafter called registered semester. At the beginning of each semester as per his/her eligibility, a student will complete the formalities of registration for a semester by paying the prescribed fees and by filling the continuity form. Any semester in which a student has registered for a course will be called a registered semester subject to the following:-

(i) Only the odd and even semesters of an academic year can be registered semester.

(ii) A semester when a student has been granted semester withdrawal/leave or a semester when a student is suspended from the institute on disciplinary or any other grounds will not be counted in the number of registered semesters.

(iii) A semester in which a student is allowed by the institute to undergo semester-longinternshipwillbecountedas a registered semester.

The minimum number of registered semesters for completing all degree requirements will be eight.

4. ATTENDANCE REQUIREMENT

The attendance requirement of the students shall be as under:-

"In compliance of the decision of the Hon'ble High Court, all students are required to fulfill the 75% attendance rule in each subject, and there must be 75% attendance of the student before he/she could be permitted to appear in the end term examination".

Condonation of shortage of attendance:- The Shortage of attendance up to the limits specified below may be condoned on valid reasons:-

(i) Up to 6% in each subject plus 5 attendances in all aggregate of subject/ courses may be condoned by the Vice-Chancellor on the recommendation of the Dean / Director/ Principal for undergraduate students and on the recommendation of the Head of the Department for the Postgraduate students.

(ii) The N.C.C./ N.S.S. cadets sent out to parades and camps and such students who are deputed by the University to take part in games, athletics or cultural activities may for purposes of attendance be treated as present for the days of their absence in connection with the aforesaid activities and that period shall be added to their subject wise attendance.

5. DEPARTMENT

Each program is offered by an academic unit which is called as a department. The name of the Departments and their codes are given in Table 1.

TABLE 1: ACADEMIC DEPARTMENTS

NAME OF ACADEMIC DEPARTMENT	CODE OF ACADEMIC DEPARTMENT/SECTION
ARCHITECTURE AND TOWN PLANNING	AR
CHEMICAL ENGINEERING	CH
CIVIL ENGINEERING	CE
COMPUTER SCIENCE AND ENGINEERING	CSE
ELECTRICAL ENGINEERING	EE
ELECTRONICS AND COMMUNICATION ENGINEERING	ECE
MECHANICAL ENGINEERING	ME
MINING ENGINEERING	MI
PETROLEUM ENGINEERING	PE
PRODUCTION AND INDUSTRIAL ENGINEERING	PI
STRUCTURAL ENGINEERING	SE
PHYSICS	PHY
CHEMISTRY	CHY
MATHEMATICS	MA
HUMANITIES AND SOCIAL SCIENCE	HSC

6. UNDERGRADUATE PROGRAMS OFFERED

MBM University offers four-year undergraduate academic programmes for students in different disciplines. Admission to these programmes is based on performance in national-level tests/entrance examinations and is through REAP (Rajasthan Engineering Admission Process), a coordination body for admission to B.E./B.Tech. /B. Arch. in Rajasthan. Various programmes offered by MBM University their codes and the department name which is running that programme are listed below:-

TABLE 2: VARIOUS ACADEMIC PROGRAMS

S. No.	Academic Program	Program Code	Name of the Department running the program
1	Bachelor of Architecture	AR	ARCHITECTURE AND TOWN PLANNING
2	B.E. (Chemical Engineering)	CH	CHEMICAL ENGINEERING
3	B.E. (Civil Engineering)	CE	CIVIL ENGINEERING
4	B.E. (Computer Science and Engineering)	CSE	COMPUTER SCIENCE AND ENGINEERING
5	B.E. (Artificial Intelligence and Data Science)	ADS	COMPUTER SCIENCE AND ENGINEERING
6	B.E. (Information Technology)	IT	COMPUTER SCIENCE AND ENGINEERING
7	B.E. (Electrical Engineering)	EE	ELECTRICAL ENGINEERING
8	B.E. (Electronics and Communication Engineering)	ECE	ELECTRONICS AND COMMUNICATION ENGINEERING
9	B.E. (Electronics and Computer Engineering)	ECC	ELECTRONICS AND COMMUNICATION ENGINEERING
10	B.E. (Electronics and Electrical Engineering)	EEE	ELECTRONICS AND COMMUNICATION ENGINEERING
11	B.E. (Mechanical Engineering)	ME	MECHANICAL ENGINEERING
12	B.E. (Mining Engineering)	MI	MINING ENGINEERING

13	B.E. (Petroleum Engineering)	PE	PETROLEUM ENGINEERING
14	B.E. (Production and Industrial Engineering)	PI	PRODUCTION AND INDUSTRIAL ENGINEERING
15	B.E. (Building and Construction Technology)	BCT	STRUCTURAL ENGINEERING
16	B.E. First Year	CC	——

7. PROGRAMME STRUCTURE

Every program maintains a teaching schedule for which weekly contact hours are decided for delivering lectures (L), engaging tutorials (T) and/or performing Practical (P)/Design classes to make learning more effective. The information regarding number of courses their credits and contact hours per week are given in the teaching and examination scheme of the respective program. The associated credits of a course are based on the number of contact hours for lectures, tutorials, and practicals. A student on successful completion of the course with a passing grade will earn an equivalent number of credits. The courses are categorized into distinct categories as given in Table 3.

TABLE 3: CATEGORY OF COURSES, THEIR ABBREVIATION AND CODES

S. No.	Category	Abbreviation	Code
1	Humanities and Social Sciences including Management courses	HSMC	1
2	Basic Science courses	BSC	2
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	ESC	3
4	Professional core courses	PCC	4
5	Professional Elective courses relevant to chosen specialization/ branch	PEC	5
6	Open Subjects–Electives from other technical and/or emerging subjects	OEC	6
7	Project work, seminar, and internship in industryor	PSI	7
8	Co-curricular activity & other non-credit course	MNC	8

Each course is identified by a unique code consisting of elements N, P, C, Z, L, and D i.e., Course Code is NPCZL(D). The description of the code elements is given in the Table 4.

TABLE 4

Course Code Elements	N	P	C	Z	L	(D)
DESCRIPTION OF ELEMENTS OF CODE						
ELEMENT	DESCRIPTION					
N	Semester Number in numeric single digit i.e., 3 to 8 and F for first year (I&II Sem.)					
P	Program Code i.e., CH for B.E. (Chemical Engineering), CE for B.E. (Civil Engineering), and so on as defined in Table 2 earlier.					
C	Course Category Code from Table 3 i.e., for Professional Core Course (PCC) C= 4.					
Z	Course Number in numeric single digit i.e., 1,2,3 etc.					
L	L is either A or B it depends upon whether the course is Lecture Based or Laboratory Based. For Lecture Base L=A, Laboratory-Based L=B and for non-credit courses L=C					
D	Department Code from Table 1					

Examples of Course Code:-

Course Title	Semester Number	Program Code	Course Category	Course Number	L-T-P	Department Code	Course Code
Discrete Structures	4th	ECC	PCC	2	3-1-0	ECE	4ECC42A (ECE)
Management	6th	EE	HSMC	4	3-0-0	EE	6EE14A (EE)
Control System Lab.	6th	EE	PCC	1	0-0-2	EE	6EE41B (EE)

The course code for B.E. first year (I & II Semester) will be as given in Table 5 below.

TABLE 5

Subject Name	Subject Code	Subject Name	Subject Code
Engineering Chemistry	**FCC21A (CHY)**	**Civil Engineering Lab.**	**FCC31B (CE)**
Civil & Environment Engineering	**FCC31A (CE)**	**Engineering Graphics**	**FCC32B (CE)**
Engineering Mathematics-I	**FCC22A (MA)**	**Engg. Mechanics Lab.**	**FCC33B (SE)**
Engineering Mechanics	**FCC32A (SE)**	**Chemistry Lab.**	**FCC21B (CHY)**
Basic Electrical Engineering	**FCC33A (EE)**	**Basic Electrical Lab.**	**FCC34B (EE)**
Introduction to Computer Programming	**FCC34A (CSE)**	**Workshop Practice-I**	**FCC35B (ME)**
Engineering Physics	**FCC23A (PHY)**	**Machine Drawing**	**FCC36B (ME)**
Engineering Mathematics-II	**FCC24A (MA)**	**Physics Lab.**	**FCC22B (PHY)**
Elements of Mechanical Engineering	**FCC35A (ME)**	**Mechanical Lab.**	**FCC37B (ME)**
Basic Electronics	**FCC36A (ECE)**	**Workshop Practice-II**	**FCC38B (ME)**
Universal Human values & Communication skills	**FCC23B (HSC)**	**Computer Lab.**	**FCC39B (CSE)**
ANANDAM	**FCC14B(HSC)**	**Basic Electronics Lab.**	**FCC310B (ECE)**

8. EVALUATION

The evaluation of students in a course from third semester &onwards will be based on the performance of the student in the internal assessment (IA) and end-term examination (ETE). IA will be an ongoing process during the semester and will consist of various components as detailed below. There shall be End-term examinations (Theory as well as practical and sessional) at the end of each semester. In Lecture-based courses, the allocation of marks will be as follows:- 30 percent for IA and 70 percent for the ETE of the maximum marks specified for the course. For Laboratory-based courses, the marks will be equally distributed, with 50 percent for IA and 50 percent for the ETE of the maximum marks specified for that course. The internal assessment (IA) marks for the lecture-based course will consist of the following components:-

(i) Maximum 10% marks of the total marks specified for the course, each for Mid-Term I and Mid-Term II. Mid-Term examination will be held as per the schedule specified in the academic calendar. Answer copies of the Mid-Term examination will be shown to the students within 15 days after completion of the corresponding Mid-Term examination.

(ii) Remaining 10% marks of the total marks specified for the course to be awarded by the course instructor based on the attendance of the student and performance of the student in quizzes, tutorials, assignments, etc. The weightage of each of the above will be decided by the course instructor and will be notified to the students at the beginning of the course.

Explanation:- If the total marks specified for the course is 100 then 30 marks will be for IA & 70 marks will be for ETE. Out of 30 marks of IA, maximum of 10 marks will be there for each mid-term examination and the remaining 10 marks will be as per (ii) above.

In case of unforeseen illness or any other valid reason that has prevented a student from appearing in any of the midterm exams, the concerned instructor, after informing the Head of the

Department, may conduct a special midterm examination. The internal assessment for Laboratory-based courses will encompass attendance, fieldwork, practical work, viva-voce examination, and similar components. There will be only end term examination (ETE) for B.E. first year.

The end-term examination will be held as per the schedule notified by the office of controller of examination. These examinations will also be called as Main/University examinations. The title of these examinations will be as follows:-

At the end of First Semester	First B.E., First Semester Examination "Year"
At the end of Second Semester	First B.E., Second Semester Examination "Year"
At the end of Third Semester	Second B.E. (Program Code) Third Semester Examination "Year"
At the end of Fourth Semester	Second B.E. (Program Code) Fourth Semester Examination "Year"
At the end of Fifth Semester	Third B.E. (Program Code) Fifth Semester Examination "Year"
At the end of Sixth Semester	Third B.E. (Program Code) Sixth Semester Examination "Year"
At the end of Seventh Semester	Final B.E. (Program Code) Seventh Semester Examination "Year"
At the end of Eighth Semester	Final B.E. (Program Code) Eighth Semester Examination "Year"
Note:- Year for the session 23-24 will be 2024 and so on.	

8.1 First B.E. Examination

(a) A candidate who has attended a regular course of study at this University for the first semester of the first B.E. shall be eligible to appear at the First B.E. first-semester Examination. This examination shall be common to all programme.

(b) Every candidate appearing for the First B.E. first-semester Examination shall be required to show competent knowledge of the subjects as per the examination and teaching scheme.

(c) A candidate who has attended a regular course of study at this University for the second semester of the first B.E. shall be eligible to appear at the First B.E. second-semester Examination. This examination shall be common to all programme.

(d) Every candidate appearing for the First B.E. second-semester Examination shall be required to show competent knowledge of the subjects as per the examination and teaching scheme.

8.2 Second B.E. Examination

The course of study for the second B.E. Examination shall be separate for all programmes of study.

(a) A candidate who has successfully completed the First B.E. I semester and First B.E. II semester exams and has pursued regular courses in a specific Program of Engineering during the third semester of the Second B.E. in that Program is eligible to take the examination for the Second B.E. third semester of that Program of study.

(b) All candidates appearing for the Second B.E. third semester examination must demonstrate sufficient knowledge of the subjects according to the examination and teaching scheme.

(c) A candidate who has completed regular studies in a particular Program of Engineering during the fourth semester of the Second B.E. in that Program and has also taken the Second B.E. third semester examination for that Program is eligible to appear for the Second B.E. fourth semester examination in that Program of study.

(d) Every candidate appearing for the Second B.E. fourth semester examination must exhibit a proficient understanding of the subjects as per the examination and teaching scheme.

8.3 Third B.E. Examination

(a) A candidate who has successfully completed the Second B.E. III semester and Second B.E. IV semester exams and has pursued regular courses in a specific Program of Engineering during the fifth semester of the Third B.E. in that Program is eligible to take the examination for the Third B.E. fifth semester of that Program of study.

(b) All candidates appearing for the Third B.E. fifth semester examination must demonstrate sufficient knowledge of the subjects in accordance with the examination and teaching scheme.

(c) A candidate who has completed regular studies in a particular Program of Engineering during the fifth semester of the Third B.E. in that Program and has also taken the Third B.E. fifth semester examination for that Program is eligible to appear for the Third B.E. sixth semester examination in that Program of study.

(d) Every candidate appearing for the Third B.E. sixth semester examination must exhibit a proficient understanding of the subjects as per the examination and teaching scheme.

8.4 Final B.E. Examination

(a) A candidate who has successfully completed the Third B.E. V semester and Third B.E. VI semester exams and has pursued regular courses in a specific Program of Engineering during the seventh semester of the Final B.E. in that Program is eligible to take the examination for the Final B.E. seventh semester of that Program of study.

(b) All candidates appearing for the Final B.E. seventh semester examination must demonstrate sufficient knowledge of the subjects according to the examination and teaching scheme.

(c) A candidate who has completed regular studies in a particular Program of Engineering during the seventh semester of the Final B.E. in that Program and has also taken the Final B.E. seventh semester examination for that Program is eligible to appear for the Final B.E. eighth semester examination in that Program of study.

(d) Every candidate appearing for the Final B.E. eighth semester examination must exhibit a proficient understanding of the subjects as per the examination and teaching scheme.

9. CRITERIA TO PASS AND ALLOWED TO KEEP TERM (ATKT)

To pass in any semester, a candidate should obtain at least 'P' grade (awarded based on aggregate marks of IA and ETE of that course) in each lecture-based course, and at least 'B' grade (awarded based on aggregate marks of IA and ETE of that course) in each laboratory-based course of that semester. Furthermore, a candidate should obtain a SGPA (Semester Grade Point Average) of at least 5.0 in that semester. After passing a particular semester the candidate will be allowed to study as a regular candidate in the next higher semester as per conditions 10.1 to 10.4. Each course (either Lecture-based or Laboratory-based) hereinafter for this section will be referred to as a unit. Furthermore, in certain cases even if a candidate has failed in one or more units the candidate will be allowed to study as a regular candidate in the next higher semester. This condition of allowing a candidate to pursue regular studies in next higher semester even if the candidate has not passed in previous semester is termed as allowed to keep term (ATKT). The conditions to be followed for ATKT are as follows:-

(a) To pass in any lecture-based course a candidate must obtain at least 30% of the maximum marks allocated for internal assessment (IA) and at least 35% of the total marks (IA & ETE) prescribed for that course. Furthermore, if a candidate fails to secure at least 30% of the maximum marks of internal assessment (IA) in a particular course the candidate will be

treated as failed in that course even if the candidate has secured 35% or more of the total marks (sum of IA & ETE marks) prescribed for that course.

(b) If a candidate fails in not more than 3 units in a semester examination, he/she shall be allowed to keep term (ATKT) i.e., the candidate will be allowed to study as a regular candidate in the next higher semester and for passing that semester he/she has to complete all the formalities of that semester. However, additionally he/ she shall have to reappear in the end-term examination of those units (s) that the candidate could not pass earlier along with other regular candidates whenever the examination of that semester is held and has to pass in the unit (s) in which he/she had failed. For the purpose of this clause, each lecture-based course and each laboratory-based course shall be counted as a separate unit. Furthermore, the internal assessment marks obtained by him/her shall be carried over. If any student wants to improve his/her marks in IA in which the candidate had failed earlier then that candidate will be required to complete all the formalities of IA of that course such as appearing in midterm examination, submitting the assignments, performing the laboratory experiments etc. as the case may be after paying the stipulated fees and after registration in that course whenever next that course is available for registration.

(c) HUMANITIES & ENGLISH shall not be counted as a unit while applying (a) above. In other words, as a special criterion, a candidate shall be allowed to keep term even though he/she has failed in HUMANITIES & ENGLISH in addition to up to another three units.

(d) Suppose a candidate fails in more than three units (theory & practical) of the prescribed courses for him/her in that semester or does not secure the prescribed minimum SGPA in that semester. In that case, he/she shall not be permitted to continue his/her studies in the next higher semester and shall be treated as an Ex-student. He/she has to reappear in all the courses of that semester whenever the examination of that semester is held. All the marks obtained earlier in internal assessment shall be carried over. If any student wants to improve his/her marks in IA in one or more courses then that candidate will be required to complete all the formalities of IA of that course such as appearing in midterm examination, submitting the assignments, performing the laboratory experiments, etc. as the case may be after paying the stipulated fees and after registration in that course whenever next that course(s) is(are) available for registration.

(e) A candidate who has passed all laboratory-based courses of a particular semester but has failed in more than three lecture-based courses of that semester shall be required to reappear only in the end-term examination of all lecture-based courses of that semester examination as Ex-student whenever the examination of that semester is held. All the marks obtained earlier by the candidate in the laboratory-based courses (i.e., internal assessment plus the end-term marks) shall be carried over. Also, the marks obtained earlier in the internal assessment of the lecture-based courses shall be carried over. If any student wants to improve his/her marks in IA in one or more lecture-based courses then that candidate will be required to complete all the formalities of IA of that course such as appearing in midterm examination, submitting the assignments, etc., after registration in that course whenever next that course(s) is(are) available for registration.

(f) For passing a laboratory-based course there is an additional requirement that a candidate must obtain at least 50% marks in internal assessment of that course, failing which the candidate shall not be permitted to appear in end-term examination (ETE) of that course in that semester. For such cases, a candidate will be declared failed in that course. Those

candidates who have failed in a course have to join as a regular student in that course whenever it is offered next by the department based on the availability of resources and suitability of the candidate. The Head of the Department may organize and arrange special classes for the particular subject to minimize the loss to the student who fails in VIII semester. In case the course is discontinued in the department, the student can take up another course in lieu of the course discontinued, subject to approval of the Head of the Department.

(g) A candidate who fails in any elective subject may be permitted by the Head of the Department to change the elective subject in a subsequent semester. He/she shall be required to undergo a regular course of study for the new elective subject.

(h) The candidates who are permitted to appear as ex-students shall be required to pay a prescribed fee as amended from time to time for doing each practical and sessional during the semester.

(i) A candidate who is unable to appear at the end-term examination in some/all lecture-based or Laboratory-based courses due to any reason whatsoever, shall be considered as having failed in those courses.

S. No.	Duration of Training	Mode of Training	After	Exam Semester	Credit
1	Six weeks	In-house/Industry	II Year (IV Semester)	V	1.0
2	Six weeks	In-house/Industry	III Year (VI Semester)	VII	1.0
				TOTAL	2.0

10. MANDATORY TRAINING

11. CHANGE OF BRANCH IN SECOND YEAR

A candidate, promoted to II year B.E., may be permitted to change his/her branch of study, from GAS course to GAS Course and from SFS Course to SFS Course only, strictly on the base of merit secured in B.E. I year examination (First and Second Semester Examination taken together) depending upon the vacancies available in a particular branch of study which shall be determined as follows:-

"The maximum strength of branch should not increase by more that 10 percent of the sanctioned strength and the minimum strength of a branch should not be decreased to less than 90 percent of the sanctioned strength."

The sanctioned strength of a branch shall be reckoned to be the intake capacity of that branch, approved by AICTE.

12. RESULT COMPUTATION (Award of Grade and Grade Point Average)

(a) On the basis of the percentage of obtained marks the process of result computation will be as follows, and followings will be awarded:-

For every subject: Grade and Score Point

For every semester: Semester Grade Point Average (SGPA) up to a precision of two digits after the decimal.

For every semester: Cumulative Grade Point Average (CGPA) up to the current semester, up to a precision of two digits after the decimal.

Step 1:- For each subject the percentage of obtained marks will be converted into Grade as per Table I.

TABLE I: PERCENTAGE OF OBTAINED MARKS TO GRADE CONVERSION		
Percentage of Obtained Marks in Theory Subjects	**Percentage of Obtained Marks in Practical Subjects**	**Grade**
Per ≥ 90	Per ≥ 90	O
80≤per<90	80≤per<90	A+
70≤per<80	70≤per<80	A
60≤per<70	60≤per<70	B+
50≤per<60	50≤per<60	B
40≤per<50	NA	C
35≤per<40	NA	P
per<35	per<50	F
Absent	Absent	AB

Step 2:- For each subject convert the Grade to Score Point as per Table II.

Table II: Grade to Score		**Performance**
Grade	**Score/Grade Point**	
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Fair
C	5	Average
P	4	Pass
F	0	Fail
W	0	Withdrawal from Semester
X	0	Debarred
AB	0	Absent

Step 3:- Semester Grade Point Average (SGPA) of kth semester is:-

$$\boldsymbol{SGPA = \frac{\sum_{i=1}^{n} P_i * C_i}{\sum_{i=1}^{n} C_i}}$$

Where Pi is Score Points in ith subject, Ci is Credits of ith subject, and n is total number of subjects in current kth semester

Step 4:- Cumulative Grade Point Average (CGPA) of kth semester is

$$\boldsymbol{CGPA = \frac{\sum_{j=1}^{m} S_i * C_i}{\sum_{j=1}^{m} C_i}}$$

Where Sj is SGPA of jth semester, Cj is total Credits in jth semester, and m is total number of semesters upto current kth semester.

(b) For determining merit position of the candidates at the final year level the SGPA obtained by them in III semester to VIII semester shall only be considered, termed as MGPA (Merit Grade Point Average). MGPA shall be calculated as below:-

$$\boldsymbol{MGPA = \frac{\sum_{i=3}^{8} S_i * C_i}{\sum_{i=3}^{8} C_i}}$$

Where Si is SGPA of ith semester, Ci is total Credits in ith semester.

(c) In case a candidate passes any subject in 2nd attempt or later one, the grade awarded shall not be higher than B+ in that subject.
(d) Awarded SGPA and CGPA shall be recalculated if a candidate passes a subject or all subjects of any semester in 2nd or later attempt.
(e) To calculate SGPA and CGPA, obtained marks for all subjects shall be considered irrespective of whether it is F grade (Failed or Absent) or any other grade.

13. CONVERSION OF GRADES

Whenever it is expedient to convert the SGPA/CGPA into percentage of marks the following formulas to be used:-

Equivalent % of marks from SGPA = (SGPA – 0.5) x 10

Equivalent % of marks from CGPA = (CGPA – 0.5) x 10

A candidate will be awarded the degree with first division if he/she secures 60% or more by converting the overall CGPA obtained at the end of VIII semester into percentage using the above formula. Furthermore, a candidate will be awarded the degree with honors if a candidate secures 70% or more by converting the overall CGPA obtained at the end of VIII semester into percentage using the above formula.

14. MOOCS (SWAYAM/NPTEL) COURSES

1. The courses being offered by SWAYAM/NPTEL platform will be offered to students of this University for credit transfer.
2. A student may complete a MOOC (SWAYAM/NPTEL) course and transfer equivalent credits to partially complete the mandatory credit requirements of the concerned B.E. program.
3. The HODs will finalize the list of courses which are available and can be offered as self-paced courses through MOOCS.
4. Respective HODs shall decide upon the course/courses which a department shall allow to be taken as Massive Open Online Course/s (MOOCS) through SWAYAM/NPTEL and for credit transfer. While deciding the self-paced courses the HODs shall take following into consideration:- (a) There is non-availability of suitable teaching staff for running such a course in the Department/Faculty (b) The facilities for offering elective papers (Courses) (already specified in the syllabus) sought for by the students are not available in the department/faculty and this course is available in the list of course specified by the SWAYAM. (c) The self-paced course offered through SWAYAM would supplement the teaching-learning process in the Department.
5. While deciding the course/courses which a department shall permit to be taken as an online course, it should be taken into consideration that any student can take only up to 20% of the total courses in a program in a semester as self-paced course/courses.
6. Based on the points 3, 4,5 and 6 as mentioned above each department on direction of HODs shall prepare a list of approved MOOC courses. Thereafter, before the commencement of each semester, the department shall release a list of MOOC courses approved as Departmental Elective Courses.
7. A student shall enroll only in such notified MOOC (SWAYAM/NPTEL) courses as published by the concerned department.
8. MOOCS courses will be considered for transfer of credits only if the concerned student has successfully completed and obtained the MOOC certificate to this effect.

9. Furthermore, each department will appoint a Coordinator to act as single point of contact (SPOC) for any matters related with these courses. The Coordinator will ensure enrolment of all the students on the SWAYAM platform as per deadlines. The Coordinator will also submit a copy of the list of the enrolled students to examination section through HOD. The Coordinator will act as a facilitator and guide the students to appear in examination as per the details provided by the Principal Investigator/Host Institution.
10. After the conduct of the examination and completion of evaluation process the Departmental Coordinator will collect the details of grades obtained by each student along with a copy of their certificates. Based on these details each department will prepare a consolidated list (subject-wise/course-wise) of the obtained grades by the students along with their names. The HODs will then send the same to the office of controller of examination of the University for mobility of the grades.
11. In case of the difficulty the Department SWAYAM coordinator can contact the University Coordinator for SWAYAM. For this purpose, University will appoint a University SWAYAM coordinator who shall act as a single point of contact (SPOC) at the University level. University SWAYAM coordinator shall act as a single point of contact and shall work as an interface between colleges, departments, and UGC.
12. A student cannot request for transfer of credits for any course not approved by the Departmental council of the concerned Department.
13. The credit equivalence of the MOOC Course will be as follows: 12 weeks-3 credits, 8 weeks 2 credits, and 4 weeks 1 credit.
14. The grading for the MOOC Course will be as given in the table below:-

Final Score on MOOC Certificate	Grade
Per ≥ 90	O
80≤per<90	A+
70≤per<80	A
60≤per<70	B+
50≤per<60	B
40≤per<50	C
35≤per<40	P
per<35	F
Absent	AB

15. MEDIUM OF INSTRUCTION AND EXAMINATION

The medium of Instructions and Examination in all Engineering Examinations of Theory/Practical and Sessional shall continue to be English as hitherto.

16. MAKE UP EXAMINATION FOR VIII SEMESTER

(a) There shall be a Make up Examination for the VIII Semester only for those candidates, who are eligible for ATKT in VIII semester, at a suitable interval of time after declaration of the result of the VIII Semester Examination. Candidates, who fail or are unable to appear at this examination, shall appear in the immediate corresponding ensuring Semester Examination.

(b) Candidates who have failed in the Final B.E. Examination but have passed in seminar, project, practical training, and tour, and obtained SGPA 5.00 or above in corresponding semester, shall be exempted from re-examination in project, practical training, and tour and shall be required to pass the examination in rest of the subjects only.

(c) A candidate who passes in a limited number of Theory papers/Practical and Sessional /Project in VIII Semester Examination shall be awarded division/CGPA with a mention of "Pass in more than one attempt" on the marksheet with asterisks on the respective Theory papers/ Practical and Sessional / Project.

17. ON CHANGING TEACHING AND EXAMINATION SCHEME OR CONTENTS OF THE OFFERED SUBJECTS

(a) In case a candidate fails in any semester, and appears as ex-student, he will be given two additional attempts to pass through OLD SCHEME. Otherwise, he will be transferred to NEW SCHEME offered by the department currently.

(b) If a candidate joins any semester as regular student, in all cases he/she has to study as per the currently offered scheme.

(c) In case a candidate fails in some of the subjects in a semester (ATKT), he will be given only two chances to pass through OLD SCHEME. Otherwise, he will be transferred to NEW SCHEME offered by the department currently.

18. RE-EVALUATION RULES

1. Re-evaluation of answer books of End Term Exam shall be permissible in not more than 50% of the lecture-based courses subject to a maximum of three lecture-based courses where the total number of courses (lecture-based + laboratory-based) are six, and a maximum of four lecture-based courses where the total number of courses (lecture-based + laboratory-based) are more than six. Where the number of courses in which a candidate appeared at an examination happens to be an odd number, it will be increased by one for the purpose of reckoning 50% of courses subject to the limit of courses prescribed as above.
2. Re-evaluation will not be permitted for the following Examination:-
   (a) Practical and Sessional
   (b) Internal Assessment (IA)
3. A candidate who wishes to apply for reevaluation of his/her answer books should submit an application in the prescribed form together with the requisite fee to the Controller of Examination before the expiry of 07 days from the date of the declaration of his/her result.
4. No application received without the requisite fee or after the last date determined as in Clause (3) shall be entertained.
5. If the award of the re-evaluator is more/less than the award of the main examiner and is subject to a limit of 20% of the maximum marks of the ETE prescribed for the course, the award re-evaluator shall be taken as the marks obtained in reevaluation. However, if the award of the re-evaluator is more/less than the award of the main examiner beyond this limit than the computation of the revised marks shall be as under:-
   Marks awarded by the main examiner $\pm$ 20% of the maximum marks of ETE of the course paper.

19. FOR LATERAL ENTRY CANDIDATES ADMITTED TO SECOND B.E. (ALL BRANCHES)

(a) The diploma-passed candidates admitted in the Second B.E. (all branches) shall be required to undergo a regular course of study in Special Mathematics III and IV semesters of II B.E. along with other theory units of the semester examinations. For a candidate to pass in Special Mathematics examination the combined marks obtained in III & IV Semester shall be counted. Candidate failing in special mathematics shall be awarded one additional ATKT.

(b) The B.Sc. Passed candidates admitted to Second B.E. (all branches) will have to clear deficiencies of engineering subjects (theory and practical of B.E. I year) as decided by the concerned Dean.

20. CO-CURRICULAR ACTIVITIES

Co-curricular activities marks shall be awarded by the concerned Head for B.E. II Year and onwards and concerned Dean for B.E. I Year students. Minimum passing marks in Co-curricular activities shall be 35%. If a candidate fails to obtain at least 35% marks then he/she shall has to complete the required activities in the next semester.

TEACHING AND EXAMINATION SCHEME

B.E. I Year (I & II Semester) Examination 2024 (As per CBCS)

Course Category	Course Code	Subject	L	T/P	Contact Hours	Exam Hours	Credits	Marks		
	FIRST SEMESTER (SECTION – A, B, C & D) / SECOND SEMESTER (SECTION-E, F, G & H)									
(A)	***Theory***	***A; Theory Paper***						**IA**	**ETE**	Total
BSC	FCC21A (CHY)	ENGINEERING CHEMISTRY	3		3	3	3	30	70	100
ESC	FCC31A (CE)	CIVIL & ENVIRONMENT ENGINEERING	3		3	3	3	30	70	100
BSC	FCC22A (MA)	ENGINEERING MATHEMATICS-I *	4		4	3	4	30	70	100
ESC	FCC32A (SE)	ENGINEERING MECHANICS	3		3	3	3	30	70	100
ESC	FCC33A (EE)	BASIC ELECTRICAL ENGINEERING	3		3	3	3	30	70	100
	Total (A)		**16**		**16**		**16**	**150**	**350**	**500**
(B)	***B: Practicals and Sessionals:***							**PRS**	**PRE**	
ESC	FCC31B (CE)	CIVIL ENGINEERING LAB		3	3	3	1.5	50	50	100
ESC	FCC32B (CE)	ENGINEERING GRAPHICS		3	3	3	1.5	50	50	100
ESC	FCC33B (SE)	ENGINEERING MECHANICS LAB		2	2	3	1	50	50	100
BSC	FCC21B (CHY)	CHEMISTRY LAB		3	3	3	1.5	50	50	100
ESC	FCC34B (EE)	BASIC ELECTRICAL LAB		2	2	3	1	50	50	100
ESC	FCC35B (ME)	WORKSHOP PRACTICE – I		2	2	3	1	50	50	100
HSMC	FCC23B (HSC)	UNIVERSAL HUMAN VALUES AND COMMUNICATION SKILLS		2	2	3	1	50	50	100
	FCC14B(HSC)	ANANDAM			1			-	Grade (O/A/B)	-
	Total (B)				**18**		**8.5**	**350**	**350**	**700**
	Grand Total (A+B)			**17**	**34**		**24.5**			**1200**
	FIRST SEMESTER (SECTION-E, F, G & H) / SECOND SEMESTER (SECTION – A, B, C & D)									
(A)	***Theory***	***A; Theory Paper***						**IA**	**ETE**	
ESC	FCC34A (CSE)	INTRODUCTION TO COMPUTER PROGRAMMING	3		3	3	3	30	70	100
BSC	FCC23A (PHY)	ENGINEERING PHYSICS	3		3	3	3	30	70	100
BSC	FCC24A (MA)	ENGINEERING MATHEMATICS – II *	4		4	3	4	30	70	100
ESC	FCC35A (ME)	ELEMENTS OF MECHANICAL ENGINEERING	3		3	3	3	30	70	100
ESC	FCC36A (ECE)	BASIC ELECTRONICS	3		3	3	3	30	70	100
	Total (A)		**16**		**16**		**16**	**150**	**350**	**500**
(B)	***Practicals and Sessionals:***							**PRS**	**PRE**	
ESC	FCC36B (ME)	MACHINE DRAWING		3	3	3	1.5	50	50	100
BSC	FCC22B (PHY)	PHYSICS LAB		2	2	3	1	50	50	100
ESC	FCC37B (ME)	MECHANICAL LAB		2	2	3	1	50	50	100
ESC	FCC38B (ME)	WORKSHOP PRACTICE – II		2	2	3	1	50	50	100
ESC	FCC39B (CSE)	COMPUTER LAB		2	2	3	1	50	50	100
ESC	FCC310B (ECE)	BASIC ELECTRONICS LAB		2	2	3	1	50	50	100
HSMC	FCC23B (HSC)	UNIVERSAL HUMAN VALUES AND COMMUNICATION SKILLS		2	2	3	1	50	50	100
	FCC14B(HSC)	ANANDAM			1			-	Grade (O/A/B)	-
	Total (B)				**16**		**7.5**	**350**	**350**	**700**
		Grand Total (A+B)		**15**	**32**		**23.5**			**1200**
Grand Total for First Year (Semester I and Semester II)							**48**			**2400**
ANANDAM & EXTRA CURRICULAR ACTIVITIES (are not to be considered for the award of Grade and Grade Point Average)										100

MATHEMATICS I & II will be common for all sections in both First and Second Semester.

In EXTRA CURRICULAR ACTIVITIES student has to obtain minimum 35 % marks.

FCC21A (CHY): ENGINEERING CHEMISTRY

3L **ETE: 70 marks, IA: 30 marks**

Unit – I: Water & Water Analysis:

Sources of water, requisites of wholesome water, Methods of treatment of water for domestic and industrial use, sedimentation filtration and industrial use, sedimentation filtration and industrial use, sedimentation filtration and sterilization of water, break point chlorination. Water as solvent, types of impurities present in water, Hardness of water, units of hardness, inter-relationship between various units, determination of hardness, alkalinity, chloride, sulphate, fluoride and iron, dissolved oxygen and carbon dioxide.

Unit – II: Fuels:

Solid fuels:Coal its original and classification, proximate and ultimate analysis, gross and net calorific values. Determination of calorific values by Calorimeter, soft and metallurgical coaks, Carbonisation process.Liquid fuels: Merits and demerits, natural gasoline, different types of gasoline obtained from catalytic cracking reforming polymerization, synthetic gasoline. Gaseous fuels: Water gas, producer gas, Semi water and carbureted gas, CNG, LPG, their preparation, composition and calorific values, Junker's calorimeter Analysis of the gases by Orsa apparatus [Numerical problems based on above]. Nuclear fuels: Nuclear binding energy, nuclear fission and nuclear fusion, elementary idea reactor concepts, nuclear power reactor and breeder reactor.

Unit – III: Corrosion & Cement:

Classification and theories of corrosion, Factors effecting corrosion, corrosion control by alloying, passivators inhibitors and alternative by environment and by catholic protection. Raw materials and principles of manufacturing cement, chemistry of setting of cement and analysis of cement.

Unit – IV: Abrasives:

Abrasive power, natural and artificial abrasives, their general properties and uses. Refractoriness: Definition, criteria, classification and uses.

Unit – V: Polymers:

Classification types and mechanism of polymerization, methods of polymerization, important polymers and resins, constituents of plastics, fabrication of plastic material.Natural and synthetic rubber, vulcanization of rubber, silicon oils.

Course Objective:

CO 1. Understand the challenges related to water quality and treatment processes.
CO 2. Distinguish the chemistry of various fuels and their combustion.
CO 3. Develop fundamental knowledge about corrosion and cementitious materials.
CO 4. Familiarise about abrasion and refractory materials.
CO 5. Isolate the design features of product of polymers.

Text/Reference Books:

1. Engineering Chemistry, by ManishaAgrawal.
2. University chemistry, by B. H. Mahan
3. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
4. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
5. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
6. Physical Chemistry, by P. W. Atkins
7. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp
8. Alternative NPTEL/SWAYAM Course:

S. No.	PTEL Course Name	Instructor	Host Institute
1	Chemistry - I	Prof. Mangala Sunder Krishnan	IITM

FCC31A (CE): CIVIL AND ENVIRONMENTAL ENGINEERING

3L **ETE: 70 marks, IA: 30 marks**

Section – A

Various types of maps and their uses. Principles of Survey, Errors in measurement, measurement of horizontal distances, offsetting, rating and reciprocal ranging.
Compass Survey: Principle, declination, local attraction. Levelling: Basic Definition curvature & refraction, reciprocal levelling, fly levelling, calculations of levels.
Basic Building Materials: Cement, Bricks, Stone, Wood, Concrete. Function and requirements of foundation, Bricks masonry, Stone Masonry, Introduction of Building Component like stairs, floors Green Building, Basic of stair cases, roof.

Section- B

Basics of Environment, Global Environmental issues, Environmental issues, Environmental Laws in India. Concept of Integrated built environment, concept of sustainable development, Role of an individual in conservation of natural resources. Sources of water, Water quality Impurities in Water & their removal. Eutrophication of lakes. Self-purification of streams, Basics of waste water treatment.
Concept of Ecosystem – Structure and function of ecosystem cycles, food chains, Major Ecosystem. Bio diversity – definition, Genetic Biodiversity, species biodiversity, Ecosystem Biodiversity, value of Biodiversity, threats of biodiversity, conservation of biodiversity. Types of solid wastes. Municipal solid waste collection and disposal methods, E-Waste handling. Nuclear waste Management.

Note: Scope of study is limited to the basic knowledge and interpretation of topics given in all the units. Students have to attempt at least two questions from each section & total five questions.

Reference Books:

1. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Surveying Vol. I, January 2016.
2. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Building Construction, January 2016.
3. Saurabh Kumar Soni, Building Materials & Construction, 1 November 2013
4. Aloka Debi, Environmental Science and Engineering: For All Undergraduate Engineering Students, 1 January 2008.

Cos	Cos Detail	Syllabus Covered
CO1	Students will be able to explain and apply the principles of surveying and techniques.	Various types of maps and their uses. Principles of Survey, Errors in measurement, measurement of horizontal distances, offsetting, rating and reciprocal ranging.
CO2	Students will develop the skills to conduct compass surveys and levelling.	Compass Survey: Principle, declination, local attraction. Levelling: Basic Definition curvature & refraction, reciprocal levelling, fly levelling, calculations of levels.
CO3	Students will gain knowledge about the characteristics and uses of basic building materials and building components.	Basic Building Materials: Cement, Bricks, Stone, Wood, Concrete. Function and requirements of foundation, Bricks masonry, Stone Masonry, Introduction of Building Component like stairs, floors Green Building, Basic of stair cases, roof.
CO4	Students will understand global and local environmental issues, relevant environmental laws in India, the concept of sustainable development.	Basics of Environment, Global Environmental issues, Environmental issues, Environmental Laws in India. Concept of Integrated built environment, concept of sustainable development, Role of an individual in conservation of natural resources. Sources of water, Water quality Impurities in Water & their removal. Eutrophication of lakes. Self-purification of streams, Basics of waste water treatment.
CO5	Students will comprehend the structure and function of ecosystems, Biodiversity, and Waste Management.	Concept of Ecosystem – Structure and function of ecosystem cycles, food chains, Major Ecosystem. Bio diversity – definition, Genetic Biodiversity, species biodiversity, Ecosystem Biodiversity, value of Biodiversity, threats of biodiversity, conservation of biodiversity. Types of solid wastes. Municipal solid waste collection and disposal methods, E-Waste handling. Nuclear waste Management.

FCC22A (MA): ENGINEERING MATHEMATICS-I

4L **ETE: 70 marks, IA: 30 marks**

Unit I:

Partial differentiation and its applications, Maxima-Minima of two or more independent variants Jocobians.

Unit II:

Asymptotes &Curvature (only for Cartesian), Envelope and evolute, Curve tracing& Standard polar cure (Cardioids, Limaçons, Lemniscates&Equiangular spiral).

Unit III:

Integral calculus: Gamma and Beta functions, Rectification differentiation under the sign of integration.

Unit IV:

Double and Triple integral, its application to area and volume, centre of gravity.

Unit V:

Vector calculus: Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Gradient, curl and divergence, Theorems of Green, Gauss and Stokes (without proof) and their applications.

COURSE OUTCOMES:

CO 1: Determine, and apply, the important quantities associated with partial differentiation.
CO 2: Use basic knowledge of Asymptotes & Curvature, Envelope and evolute, Curve tracing.
CO 3: Demonstrate the ability toIntegral calculus: Gamma and Beta functions
CO 4: Knowledge of Double and Triple integral.
CO 5: Demonstrate knowledge of Vector calculus, Gradient, curl and divergence, Theorems of Green, Gauss and StokesMatrix.

Text / Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Note: The modules have been prepared keeping the following from the Textbooks/References in mind:
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

FCC 32A (SE): ENGINEERING MECHANICS

3L **ETE: 70 marks, IA: 30 marks**

Systems of coplanar forces, Resultant of concurrent forces, parallel forces and non-concurrent non parallel system of forces, moment of force about any point, couples, Varignon's theorem, distributed forces in plane. Equilibrium of system of coplanar forces, condition of equilibrium for concurrent forces, parallel forces and non-current, non-parallel general system of forces and couples.

Simple Stresses and Strains: Concept of stress and strain in three dimensions and generalized, Hook's law; Direct Stress and strain: free body diagrams, Young's modulus; Tension Test of mild steel and other materials: true and apparent stress, ultimate strength, yield stress and permissible stress: Stresses in prismatic and non prismatic members and in composite members: Temperature stresses; Shear stress, Shear Strain, Modulus of rigidity.

Elastic constants- Poisson's ratio, Volumetric strain, Bulk modulus, relation between elastic constants, State of simple shear, Complementary shear stress.

Types of supports, loads, beams. Determination of reactions at supports for various types of loads on statically determinate beams. Introduction to Shear force and bending moment diagrams (concentrated loads and uniformly distributed loads over cantilever and simply supported beams).

Analysis of plane trusses by using method of joints and method of section.
Introduction to centroid and centre of gravity, introduction to area moment of inertia and its theorem.

Friction- Introduction to laws of friction, cone of friction, equilibrium of bodies on inclined plane.

Belt friction- Transmission of power by belts and ropes, centrifugal and initial tension in the belts and ropes, condition of maximum power transmission, flat belts & flat pulleys and ropes on grooved pulleys.

Reference Books

'Engineering Mechanics' by Basudeb Bhattacharya, Oxford University Press
'Engineering Mechanics– Statics and Dynamics' by N.H. Dubey, Mc Graw hill Publication
'Engineering Mechanics' by S.S. Bhavikatti, New Age India Publishers
'Mechanics of Materials' by B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications
'A Textbook of Engineering Mechanics' by R.S. Khurmi, S. Chand & Company Limited
'Theory of Machines' by Sadhu Singh, Pearson Education – (For Belts and Ropes)

COURSE OUTCOMES

COs	CO Detail	Syllabus covered
CO1	Students will be able to analyze and resolve various systems of coplanar forces, including concurrent, parallel, and non-concurrent non-parallel forces.They will be able to determine the resultant force and moments acting on a system using principles like Varignon's theorem.	Systems of coplanar forces, Resultant of concurrent forces, parallel forces and non-concurrent non parallel system of forces, moment of force about any point, couples, Varignon's theorem, distributed forces in plane. Equilibrium of system of coplanar forces, condition of equilibrium for concurrent forces, parallel forces and non-current, non-parallel general system of forces and couples.
CO2	Students will be able to comprehend and apply concepts of stress and strain in three dimensions, including Hooke's Law and elastic constants and will be able to analyze stresses and strains in prismatic and non-prismatic members, composite members, and under temperature variations.	Simple Stresses and Strains: Concept of stress and strain in three dimensions and generalized, Hook's law; Direct Stress and strain: free body diagrams, Young's modulus; Tension Test of mild steel and other materials: true and apparent stress, ultimate strength, yield stress and permissible stress: Stresses in prismatic and non prismatic members and in composite members: Temperature stresses; Shear stress, Shear Strain, Modulus of rigidity. Elastic constants- Poisson's ratio, Volumetric strain, Bulk modulus, relation between elastic constants, State of simple shear, Complementary shear stress.
CO3	Students will be able to calculate reactions at supports for statically determinate beams under various loading conditions. They will be able to draw shear force and bending moment diagrams for cantilever and simply supported beams subjected to concentrated and uniformly distributed loads.	Types of supports, loads, beams. Determination of reactions at supports for various types of loads on statically determinate beams. Introduction to Shear force and bending moment diagrams (concentrated loads and uniformly distributed loads over cantilever and simply supported beams).
CO4	Students will be able to determine the magnitude and nature of forces in various members of trusses using the methods of joints and sections.	Analysis of plane trusses by using method of joints and method of section.
CO5	Students will be able to determine the centre of gravity and area moment of inertia of planar elements.	Introduction to centroid and centre of gravity, introduction to area moment of inertia and its theorem.
CO6	Students will understand the laws of friction, the concept of the cone of friction, and analyze the equilibrium of bodies on inclined planes.	Friction- Introduction to laws of friction, cone of friction, equilibrium of bodies on inclined plane.
CO7	Students will be able to evaluate belt and rope friction, including the transmission of power, centrifugal tension, initial tension, and conditions for maximum power transmission in flat belts and ropes on grooved pulleys.	Belt friction- Transmission of power by belts and ropes, centrifugal and initial tension in the belts and ropes, condition of maximum power transmission, flat belts & flat pulleys and ropes on grooved pulleys.

FCC33A (EE): BASIC ELECTRICAL ENGINEERING

3L **ETE: 70 marks, IA: 30 marks**

Elements of Power System: Methods of Power generation Hydroelectric, Thermal and Nuclear, Introduction to transmission and distribution, Renewable Energy.

D. C. Circuits: Kirchhoff's Laws, Superposition, Thevenin's and Norton's theorems, star-delta transformation, Power calculation.

A. C. Circuits: Generation of sinusoidal wave form amplitude, frequency, and time-period; Concept of phase and phase difference, phasor representation, Average and R.M.S. Values, Form factor for various wave forms.

Concept of impedance, Analysis of A. C. Single-phase and balanced three-phase circuits, Phasor diagrams, Power and power factor.

Transformers: E.M.F. Equation of single phase transformer, constructional features relation between voltage, current and turns ratio, Losses, Efficiency and its determination by direct loading, Auto-transformer, 3-phase transformer connections.

D. C. Machines: Constructional features, principle of operation, E.M.F. Equation of D.C. generator, Torque equation of D.C. Motor, D.C. shunt motor starter.

Three Phase Indication Motor: Constructional features, rotating magnetic field, principle of operation, concept of slip, D.O.L. Starting, star-delta starting, auto-transformer starting.

Alternators: Constructional features, EMF equation, Concept of voltage regulation.

Reference Books:

1. Charles Alexander & Mathew Sadiku, Fundamentals of Electric Circuits, McGraw-Hill, 7th Edition.
2. V K Mehta & Rohit Mehta, Basic Electrical Engineering, S. Chand
3. C L Wadhwa, Basic Electrical Engineering, New Age International Publishers, 4th Edition.
4. D P Kothari & I G Nagrath, Basic Electrical Engineering, McGraw-Hill, 4th Edition.
5. Ashfaq Husain & Haroon Ashfaq, Fundamentals of Electric Circuits, Dhanpat Raj & Co., 4th Edition.
6. M S Naidu & S Kamakshiah, Introduction to Electrical Engineering, Tata McGraw-Hill.

COs	COs Details	Syllabus Covered
CO1	Get an overview of basic electrical engineering and its application in day-to-day life	**Elements of Power System:** Introduction to transmission and distribution
CO2	Understand various methods of power generation	Methods of Power Generation Hydroelectric, Thermal and Nuclear
CO3	Demonstrate an understanding of basic concepts of analysis of simple DC and AC circuits	**D. C. Circuits:** Kirchhoff's Laws, Superposition, Thevenin's and Norton's theorems, star-delta transformation, Power calculation. **A.C. Circuits:** Generation of sinusoidal wave form amplitude, frequency, and time-period; Concept of phase and phase difference, phasor representation, Average and R.M.S. Values, Form factor for various wave forms. Concept of impedance, Analysis of A. C. Single-phase and balanced three-phase circuits, Phasor diagrams, Power and power factor.
CO4	Understand construction, operating principle and can evaluate the performance of various electrical machines	**Transformers:** E.M.F. Equation of single phase transformer, constructional features relation between voltage, current and turns ratio, Losses, Efficiency and its determination by direct loading, Auto-transformer, 3-phase transformer connections. **D. C. Machines:** Constructional features, principle of operation, E.M.F. Equation of D.C. generator, Torque equation of D.C. Motor, D.C. shunt motor starter. **Three Phase Indication Motor:** Constructional features, rotating magnetic field, principle of operation, concept of slip, D.O.L. Starting, star-delta starting, auto-transformer starting. **Alternators:** Constructional features, EMF equation, Concept of voltage regulation.

FCC31B (CE): CIVIL ENGINEERING LAB

3P **ETE: 50 marks, IA: 50 marks**

Course Outcomes:

CO1: Students will be able to understand and apply basic surveying techniques including chaining, ranging, and the use of minor instruments in civil engineering projects.

CO2: Students will demonstrate proficiency in using prismatic compasses for surveying, including taking bearings and correcting for magnetic declination.

CO3: Students will be able to execute fly levelling and profile levelling using dumpy and tilting levels to determine elevations and create profiles for civil engineering projects.

CO4: Students will learn to interpret and use conventional signs in surveying maps and drawings, aiding in the clear communication of survey results.

CO5: Students will integrate various surveying techniques, including chaining, ranging, compass surveying, and levelling, to conduct comprehensive surveys and produce accurate site maps.

List of Experiments:

1. Measure distances using a chain or tape and range survey lines.
2. Measure bearings using a prismatic compass and understand magnetic declination.
3. Conduct offset measurements using a chain and tape or a compass.
4. Perform fly levelling using dumpy and tilting levels to determine relative heights.
5. Conduct profile levelling to obtain longitudinal sections of the ground surface.

FCC32B (CE): ENGINEERING GRAPHICS

3P **ETE: 50 marks, IA: 50 marks**

Course Outcomes:

CO1: Students will be able to understand and apply the fundamental principles of engineering graphics, including accurate lettering and scaling.

CO2: Students will demonstrate proficiency in constructing and analyzing various engineering curves, including conic sections and other standard curves.

CO3: Students will develop the skill to create orthographic projections and accurately project points, lines, planes, and solids.

CO4: Students will be competent in creating sectional views of solids and developing surfaces.

CO5: Students will be able to create isometric projections.

List of Experiments:

1. To practice and master different styles of engineering lettering and numbering.
2. To understand and construct different types of scales used in engineering drawings.
3. To draw and understand the properties of conic sections.
4. To draw special plane curves used in engineering applications.
5. To project points onto different planes.
6. To project lines in different orientations and find their true lengths and angles.
7. To project various solids in different orientations.
8. To understand the sectional views of solids.
9. To develop the lateral surfaces of various geometric solids.
10. To create isometric projections to represent three-dimensional objects.

FCC 33B (SE): ENGINEERING MECHANICS LAB

2P **ETE: 50 marks, IA: 50 marks**

COURSE OUTCOMES:

CO1: Students will be able to experimentally determine the coefficient of friction between two surfaces on both a horizontal plane and an inclined plane, enhancing their understanding of frictional force, factors affecting it and its applications.

CO2: Students will be able to determine the mechanical advantage, velocity ratio, and efficiency of the first system of pulleys (fixed and movable pulley) and the second system of pulleys (block and tackle), gaining insights into the operational principles and performance of reversible machines like pulley systems.

CO3: Students will be able to determine the mechanical advantage, velocity ratio, and efficiency of a worm and worm wheel setup and a screw jack, providing them with a comprehensive understanding of the mechanical systems and the efficiency of irreversible machines like worm and worm wheel and screw jack.

CO4: Students will be able to experimentally determine the moment of inertia of a flywheel, deepening their understanding of rotational dynamics and the significance of moment of inertia in engineering applications.

LIST OF EXPERIMENTS

1. To determine the coefficient of friction between two surfaces for a horizontal plane. Combinations – wood/wood, wood/steel, wood/wool, steel/wool
2. To determine the coefficient of friction between two surfaces for an inclined plane. Combinations – Brass/wood, Brass/leather
3. To determine the mechanical advantage, velocity ratio, efficiency and law of machine for first system of pulleys and second system of pulleys
4. To determine the mechanical advantage, velocity ratio, efficiency and law of machine for second system of pulleys
5. To determine the mechanical advantage, velocity ratio, efficiency and laws of machine for worm and worm wheel
6. To determine the mechanical advantage, velocity ratio, efficiency and laws of machine for screw jack
7. To determine the moment of inertia of a flywheel

FCC21B (CHY): CHEMISTRY LABORATORY

3P **ETE: 50 marks, IA: 50 marks**

LIST OF EXPERIMENTS

1. pH, Buffer, choice of indicators and pHtitrations.
2. Determination of hardness of water by EDTA method.
3. Determination of dissolved oxygen in water.
4. Determination of COD of waste water.
5. Analysis of Copper.
6. Analysis of iron ore.
7. Analysis of lime store.
8. Determination of alkanity of given water sample.
9. Determination of surface tension and viscosity.
10. Determination of chloride content of water.
11. Determination of rate constant of a reaction.

Course Outcome:

CO 1. Proficient in performing various types of titration, analysing the results and applying their knowledge to solve practical problems.

CO 2. Understand the principles and significance of various parameters of water.

CO 3. Develop analytical skills for measuring quality of water samples.

CO 4. Analyse and interpret data obtained from metal percentage analyses.

CO 5. Get knowledge of calcium content in limestone.

CO 6. Develop the concept of reaction rate and factors influencing it.

FCC34B (EE): BASIC ELECTRICAL LAB

2P **ETE: 50 marks, IA: 50 marks**

Course outcomes (CO):

Students will be able to:-

CO1: Verify and analyse basic laws of electrical circuits.

CO2: Make use of starter for starting of various motors such as DC, induction motor and obtain various electrical parameters of motor.

CO3: To understand construction, operating principle of energy meter and to make use of it for determining energy consumption by load and compare it with readings obtained by wattmeter.

CO4: To evaluate performance of single-phase transformer by direct loading test.

CO5: To make use of megger to identify various types of faults in electrical installations.

LIST OF EXPERIMENTS

1. Verification of Kirchhoff's Voltage and Current Laws in D.C. Network.
2. Verification of the law of star-delta transformation in D.C. Network.
3. (a) Study of fluorescent tube circuit and to determine the minimum voltage required to
   (i) Initiate the discharge
   (ii) Maintain the discharge
   (b) To determine the power & power factor of the fluorescent tube circuit using three voltmeter method.
4. (a) Study and use of a D.C. shunt motor.
   (b) Study of D.C. shunt motor starter.
5. (a) Study and starting of three-phase squirrel-cage induction motor, using a 3-phase autotransformer.
   (b) Study of star/delta starter.
6. Study and use of a single-phase induction-type energy meter.
7. To estimate the losses in a single-phase transformer by direct loading, and to predetermine, there from, its efficiency at different loads and power factors.
8. Study and use of Megger.

FCC 35B (ME): WORKSHOP PRACTICE -I

2P **ETE: 50 marks, IA: 50 marks**

COURSE OUTCOMES:

CO1: Understand properties of wood and various methods of wood seasoning.

CO2: Understand different types of wood joints and their applications.

CO3: Make Use of appropriate carpentry tools for common wood working operations.

CO4: Understand the use of holding tools, cutting tools, striking tools, measuring and marking tools in Fitting Shop.

CO5: Make use of appropriate tools to perform basic Fitting lab operations on mild steel specimen.

LIST OF EXPERIMENTS:

1. To study different properties of wood and various seasoning methods.

2. To study various tools used in Carpentry Shop.

3. To practice common wood working operations on a wood piece as per given dimensions: Planning, Sawing, Marking and measuring, chiselling, Tennoning, Grooving and Mortising.

4. To study various types of wooden joints (T, Lap, Bridle and Mortise joint)**.**

5. To study various tools used in Fitting Shop.

6. To prepare job on square / rectangular mild steel pieces using various operations of fitting lab (e.g. Measuring, planning, marking, cutting and filing etc.) as per given dimension.

7. To demonstrate drilling and tapping operations on mild steel flat piece.

FCC34A (CSE): INTRODUCTION TO COMPUTER PROGRAMMING

3L **ETE: 70 marks, IA: 30 marks**

Introduction to Computer: Overview of Computer organization, Number systems, character representation codes, Binary, hex, octal codes and their inter conversions. Binary arithmetic, Introduction to Operating Systems, translators, compiler, interpreter and assembler.

Programming in C Language: Introduction to Problem Solving: Flow charts, Tracing flow charts, Problem solving methods, Need for computer Languages, Sample Programs written in C. C Language preliminaries: C character set, Identifiers and keywords, Data types, Declarations, Expressions, statements and symbolic constants Input-Output: getchar, putchar, scanf, printf, gets, puts, functions. Operators and expressions: Arithmetic, unary, logical, bit-wise, assignment and conditional operators.

Control statements: While, do-while, for statements, nested loops, if else, switch, break, Continue, and goto statements, comma operators. Storage types: Automatic, external, register and static variables. Functions: Defining and accessing, passing arguments, Function prototypes, Recursion, Library functions, Static functions Arrays: Defining and processing, Passing arrays to a function, Multidimensional arrays. Strings: Defining and operations on strings.

Pointers: Declarations, Passing pointers to a function, Operations on pointers, Structures: Defining and processing, Passing to a function, Unions, typedef, array of structure, and pointer to structure. File Processing: Concept of files, File opening in various modes and closing of a file, reading from a file, writing on to a file.

Introduction to Cyber Security: Information security concepts, security threats and vulnerabilities, cyber offences and cybercrimes, awareness of cyber security and its measures, awareness of authentication and authorization, password management and biometrics, awareness of cryptography, cyber law,awareness of computer viruses, spyware and their remedies.

Reference Books:

1. The C Programming Language, 2nd Edition, 2015, Brian W, Kernighan, Dennis M.Ritchie, Pearson Publication.
2. C: The Complete Reference, Fourth Edition, 2017, Hernert Schildt, Mc Graw Hill Education Publication.
3. ISO/ IEC 9899 Standard, 4th Edition, 2018, International Organization for Standardization.
4. Expert C Programming: Deep secrets, Peter Van Der Linder, First Edition, 1994, Pearson Publication.

COs	COs Details	Syllabus Covered
CO1	Understand the role and function of various hardware & software components of general-purpose computers.	Overview of Computer organization, Number systems, character representation codes, Binary, hex, octal codes and their inter conversions. Binary arithmetic, Introduction to Operating Systems, translators, compiler, interpreter and assembler.
CO2	Understand and use various syntax constructs viz. tokens, data types, expressions. I/O functions etc. of the C Programming language.	Introduction to Problem Solving: Flow charts, Tracing flow charts, Problem solving methods, Need for computer Languages, Sample Programs written in C. C Language preliminaries: C character set, Identifiers and keywords, Data types, Declarations, Expressions, statements and symbolic constants Input-Output: getchar, putchar, scanf, printf, gets, puts, functions. Operators and expressions: Arithmetic, unary, logical, bit-wise, assignment and conditional operators.
CO3	Evaluate and apply the concepts of control flow, arrays, function and storage classes in reading & writing C Program.	While, do-while, for statements, nested loops, if else, switch, break, Continue, and goto statements, comma operators. Storage types: Automatic, external, register and static variables. Functions: Defining and accessing, passing arguments, Function prototypes, Recursion, Library functions, Static functions Arrays: Defining and processing, Passing arrays to a function, Multidimensional arrays. Strings: Defining and operations on strings.
CO4	Understand the role of memory in Programming and apply the concepts of pointers, structures, unions and file handling for developing complex programs.	Declarations, Passing pointers to a function, Operations on pointers, Structures: Defining and processing, Passing to a function, Unions, typedef, array of structure, and pointer to structure. File Processing: Concept of files, File opening in various modes and closing of a file, reading from a file, writing on to a file.
CO5	Remember and identify various threats, their countermeasures and associated laws to ensure privacy and safety while working with cyber systems.	Information security concepts, security threats and vulnerabilities, cyber offences and cybercrimes, awareness of cyber security and its measures, awareness of authentication and authorization, password management and biometrics, awareness of cryptography, cyber law,awareness of computer viruses, spyware and their remedies

FCC23A (PHY): ENGINEERING PHYSICES

3L **ETE: 70 marks, IA: 30 marks**

Unit – I: Electricity and Magnetism:

Line integral of vector field, Potential difference, Field as gradient of potential and applications. Curl & Divergence of a vector function, Divergence theorem, Gauss's law- integral and differential form, Laplace's equation and simple applications, Stoke's theorem, Uniqueness theorem. Biot – savart law, curl and divergence of magnetic flux density.Ampere's Law – integral and differential form. scalar and vector magnetic potentials, fields due to finite, infinite wire, small current loop using potentials, Faraday's law – integral and differential form. Self and mutual inductance in terms of Neumann equation, charging and discharging of a capacitor through a resistor, growth and decay of current in a L-R circuit, energy stored in electric and magnetic fields,

Unit – II: Optics:

Interference:Wedge film interference, Newton's rings and Michelson's interferometer, method of measurement of wave length of light and difference of two close wave lengths. Diffraction: Single slit Fraunhoffer diffraction, Fraunhoffer diffraction by a plane transmissiongrating, Rayleigh's criterion for resolving power, resolving power of transmission grating and prism. Polarization: O & E waves, quarter wave and half wave plates, Different types of polarized electromagnetic waves. Laurent's half shade polarimeter and determination of strength of sugar solution.

Unit – III: Relativistic mechanics:

Galilean transformation, Postulates of special theory of Relativity, Lorentz transformation, Law of addition of velocities, mass variation with speed, mass energy and momentum relation.

Unit – IV: Quantum mechanics:

Introduction to quantum Mechanics, Plancks hypotheses, Planck's radiation law Einstein equation for photoelectric effect, Compton scattering, Uncertainty principle, ground state energy and size of hydrogen atom Wave-particle duality, Matter waves, Wave function and basic postulates, Time dependent and time independent Schrodinger's Wave Equation, Physical interpretation of wave function and its properties, Applications of the Schrodinger's Equation: Particle in one dimensional and three dimensional boxes.

Unit – V: Lasers& Nuclear physics:

Einstein's coefficients, spontaneous and stimulated emission, population inversion, basic featuresof laser systems, principle of operation of He- Ne laser and solid state laser, optical fibers and properties. Properties of Alpha, Beta, Gamma radiations. Basic features of a gas filled detectors, Proportional counter and Geiger- Muller counter. Bragg's law, Bragg's spectrometer-its use in study of crystal structures, Laue equations for X-ray diffraction.

Course Outcomes (CO)

CO1: Able to formulate and solve the engineeringproblems on electromagnetism.
CO2: Analyze the intensity variation of light due to polarization, interference and diffraction
CO3: Understanding of laws of special theory of relativity and their application invarious daily life examples.
CO4: Recall and recognise the terminologies of the limits of classical physics & Explain fundamentals of quantum mechanics and apply to one dimensional motion of particles.
CO5: Able to study of lasers, optical fibers and nuclear radiation detectors its applications are to import knowledge and to develop skills and to use modern instruments in the engineering applications.

Text / Reference Books:

1. "QUANTUM MECHANICS" -By Bagde MK, Kamal Singh &·Singh S P.
2. "A TEXTBOOK OF OPTICS"-By N. Subrahmanyam, BrijLal, M. N. Avadhanulu· 2012
3. "ENGINEERING PHYSICS" -By Hitendra K. Malik, Ajay Kumar Singh
4. "ENGINEERING PHYSICS", - By MARIKANI A.
5. "ELECTROMAGNETICS"-ByLaud, B. B
6. "NUCLEAR PHYSICS"-By D. C. Tayal
7. "MECHANICS" - By J C Upadhyay

FCC24A (MA): ENGINEERING MATHEMATICS-II

4L **ETE: 70 marks, IA: 30 marks**

Unit I: Ordinary differential equations, exact differential equation of first order first degree, Differential equation of first order higher degree.

Unit II: Linear differential equation with constant coefficient, Homogenous linear differential equation, Linear differential equation of second order with variable coefficient & variation of parameter methods.

Unit III: Solid geometry: Sphere, cone (right circular cone only cartesian form), cylinder (right circular cylinder only cartesian form)

Unit IV: Periodic functions, Fourier series, Euler's formula, Change of intervals,half range sine and cosine series, Parseval's theorem, Harmonic analysis.

Unit V: Linear systems of Equations; Linear Independence; Rank of a Matrix; Determinant, Inverse of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Orthogonal transformation; Diagonalization of matrices; Cayley-Hamilton Theorem.

COURSE OUTCOMES:

CO 1: Determine, and apply, the differential equation of first order higher degree.
CO 2: Use basic knowledge of linear differential equation with variable coefficient & variation of parameter methods.
CO 3: Demonstrate the ability to Solid geometry: Sphere, cone, cylinder.
CO 4: Knowledge of Fourier series, Euler's formula, Harmonic analysis.
CO 5: Demonstrate knowledge of Linear systems of Equations; Matrix; Determinant, Eigen values and eigenvectors; Orthogonal transformation.

Text / Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
   Note: The modules have been prepared keeping the following from the Textbooks/References in mind:
2. AICTE's Prescribed Textbook: Mathematics-II (Calculus, Ordinary Differential Equations and Complex Variable), ReenaGarg, Khanna Book Publishing Co, 2023.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

FCC 35A (ME): ELEMENTS OF MECHANICAL ENGINEERING

3L **ETE: 70 marks, IA: 30 marks**

Thermodynamics: Thermodynamics properties, closed and open systems, cyclic and non-cyclic processes, gas laws, internal energy. First law, application to non-flow processes only.Kelvin-Planck and Clausius statements of second law of thermodynamics. Reversible processes, Carnot cycle, Reversed Carnot cycle. [Numerical problems based on simple processes and Carnot cycle only].

Gas power cycles: Otto, Diesel and dual cycles and their air standard efficiencies.
Properties of steam: Generation of steam, triple point and critical point, Enthalpy, internal energy and entropy of steam. Use of steam table, Mollier chart and T-S chart.Heating and expansion of vapour in non-flow processes.Dryness fraction.
Introduction to Vapour power cycles:Carnot cycle and Rankinecycle(P-V and T-s diagrams.)
Introduction to Vapour compression refrigeration system, its components and cycle.

Internal Combustion Engine: Introduction, Classification, Terminology and brief description of I.C.Engine mechanism, 4 stroke and 2 Stroke petrol, gas and diesel engines; Valve timing diagrams, comparison of petrol and diesel engines. Simple carburetor.Ignition systems of S.I. Engine.Diesel fuel pump and injector. Measurement and calculations of I.P., B.P., B.S.F.C..engine performance, efficiencies.

Introduction to Primary Manufacturing Processes: Casting, pattern making and sand molding ; smithy operations, cutting, upsetting, drawing, bending and piercing; Elementary knowledge of gas welding and electric arc welding, Brazing and soldering.

Introduction to Engineering Materials and their Properties: Mechanical properties of ferrous and non-ferrous materials. Brief discussion of plain carbon steels. Effects of alloying element in steel. Cast iron, bearing materials, copper and aluminum alloys. Basics of composite and smart materials.

COs	Cos Details	Syllabus covered
CO1	Understand concept of thermodynamics and its laws.	**Thermodynamics:** Thermodynamics properties, closed and open systems, cyclic and non-cyclic processes, gas laws, internal energy. First law, application to non-flow processes only.Kelvin-Planck and Clausius statements of second law of thermodynamics. Reversible processes, Carnot cycle, Reversed Carnot cycle. [Numerical problems based on simple processes and Carnot cycle only].
CO2	Explain Gas power cycles, Vapor power cycles and Refrigeration cycles.	**Gas power cycles:** Otto, Diesel and dual cycles and their air standard efficiencies. **Properties of steam:**Generation of steam, triple point and critical point, Enthalpy, internal energy and entropy of steam. Use of steam table, Mollier chart and T-S chart.Heating and expansion of vapour in non-flow processes.Dryness fraction. **Introduction to Vapour power cycles**:Carnot cycle and Rankinecycle(P-V and T-s diagrams.) **Introduction to Vapour compression refrigeration system,** its components and cycle.
CO3	Illustrate internal combustion engine systems and its components.	**Internal Combustion Engine:** Introduction, Classification, Terminology and brief description of I.C.Engine mechanism, 4 stroke and 2 Stroke petrol, gas and diesel engines; Valve timing diagrams, comparison of petrol and diesel engines. Simple carburetor.Ignition systems of S.I. Engine.Diesel fuel pump and injector. Measurement and calculations of I.P., B.P., B.S.F.C..engine performance, efficiencies.
CO4	Demonstrate basic knowledge of primary manufacturing processes.	**Introduction to Primary Manufacturing Processes:** Casting, pattern making and sand molding ; smithy operations, cutting, upsetting, drawing, bending and piercing; Elementary knowledge of gas welding and electric arc welding, Brazing and soldering.
CO5	Explain different engineering materials and their alloys.	**Introduction to Engineering Materials and their Properties:**Mechanical properties of ferrous and non-ferrous materials. Brief discussion of plain carbon steels. Effects of alloying element in steel. Cast iron, bearing materials, copper and aluminum alloys. Basics of composite and smart materials.

FCC36A (ECE): BASIC ELECTRONICS

3L **ETE: 70 marks, IA: 30 marks**

Electronic Components & Devices: Construction and characteristics of Carbon composition, wire wound & Film resistors. Colour codes and ratings of resistors. Construction and characteristics of capacitors for electronic circuits. Air core, Iron core & Ferrite core magnetic components.

Qualitative theory of PN junction: Characteristic & Ratings of junction diode, zener diode, LED, photo diode, BJT, FET& SCR.

Regulated Power Supply: Circuit configuration and analysis of half wave and full wave rectifiers, various filter circuits. Elementary study shunt and series regulators.

Amplifiers: Classification of Amplifiers: Concepts of voltage and power Amplification. Qualitative study of different single stage audio and power amplifiers. Concept of Gain & Frequency response and input & output impedance of amplifiers. Small signal equivalent circuit of BJT. Concept of Positive& Negative feedback. Qualitative study of Sine wave Oscillators.

Basic Electronic Instruments: Principles of general purpose CRO and its elementary application. Characteristics of Electronic analog and digital voltmeters. Concept of Multimeter.

Basic Electronic Entertainment systems: Concept of AM & FM Elementary block diagram of superheterodyne receiver. AM transmitter, Basic principle of television, television transmission standards, Block diagram of television transmitter and receiver.

Reference Books:

1. Integrated Electronics by Jacob Millman , Tata McGraw Hill Edition

2. Solid state device Ben G. Streetman and Sanjay Bannerji , Prentice hall

3. S.K Sahdev, “Fundamental of Electrical & Electronics Engineering” by Dhanpat Rai

4. V.K. Mehta, Rohit Mehta, “Principles of Electronics”, S. Chand and Company

5. B.L. Theraja, “Basic Electronics Solid State”, S. Chand and Company.

6. D Chattopadhyay “ Electronics fundamentals and application” by New Age International

COs	COs Details	Syllabus Covered
CO1	Students will have brief understanding of the basic passive components.	Electronic Components & Devices: Construction and characteristics of Carbon composition, wire wound & Film resistors. Colour codes and ratings of resistors. Construction and characteristics of capacitors for electronic circuits. Air core, Iron core & Ferrite core magnetic components.
CO2	Understand the working various devices like PN junction diode, BJT, SCR, FET, LED.	Qualitative theory of PN junction: Characteristic & Ratings of junction diode, zener diode, LED, photo diode, BJT, FET& SCR.
CO3	Design a Half-wave rectifier, Full-wave rectifier, Voltage regulators, a voltage amplifier using BJT	Regulated Power Supply: Circuit configuration and analysis of half wave and full wave rectifiers, various filter circuits. Elementary study shunt and series regulators.
CO4	Analyze both positive and negative feedback circuits, using which he/she can design oscillators to generate a required frequency.	Amplifiers: Classification of Amplifiers: Concepts of voltage and power Amplification. Qualitative study of different single stage audio and power amplifiers. Concept of Gain & Frequency response and input & output impedance of amplifiers. Small signal equivalent circuit of BJT. Concept of Positive& Negative feedback. Qualitative study of Sine wave Oscillators.
CO5	Understand the working of CRO, digital Basic Electronic Instrument and analog voltmeters.	Basic Electronic Instruments: Principles of general purpose CRO and its elementary application. Characteristics of Electronic analog and digital voltmeters. Concept of multimeter.
CO6	Understand the concept of Modulation and analyze different Modulation techniques like AM, FM and PM.	Basic Electronic Entertainment systems: Concept of AM & FM Elementary block diagram of superheterodyne receiver. AM transmitter, Basic principle of television, television transmission standards, Block diagram of television transmitter and receiver.

FCC36B (ME): MACHINE DRAWAING

3P **ETE: 50 marks, IA: 50 marks**

COURSE OUTCOMES:

CO1: Understand the concept of machine drawing utilized for representation of simple machine components.

CO2: Understand and apply to draw orthographic projections of simple machine elements.

CO3: Understand and apply to draw sectional views of machine components.

CO4: Understand the importance of screw fastenings and draw their views.

CO5: Understand the importance of rivets and riveted joints and draw their views.

SYLLABUS:

Introduction to machine drawing: Use of drawing instruments, Layout of drawing sheets, Scale drawing, Types of lines, dimensioning types, rules of dimensioning, Conventional representation of machine components. **(Turn 1)**

Introduction to Orthographic Projection: First angle and third angle methods of orthographic projection, Understanding orthographic views in First angle and third angle methods with the help of model and corresponding pictorial views. (Use Fig. 3.2 and 3.4) **(Turn 2)**

- Free hand sketching of orthographic views with the help of models and pictorial views, Figs. 4.50(1), 4.42, 4.59, 4.50(5), 4.50 (4).**(Turn 3)**
- Drawing of orthographic projections: Three Views: Fig. 4.69, first angle projections; scale 2:1, Fig. 4.61, first angle projections, Scale 1:1, Fig. 4.70, first angle projections (use suitable scale) **(Turn 4, Sheet 1)**
- Drawing of orthographic Projections, Three Views: Fig 4.72, first angle projections; Fig. 4.74, third angle projections, use suitable scales. **(Turn 5, Sheet 2)**

Sectional views: Introduction, cutting plane line, type of sectional views-full section, half section, partial or broken section, revolved section, removed section, offset section, Rules of sectioning and exceptions, common mistakes in sectioning, conventional representation of section lines for different materials. (Use Fig. 8.17, 8.18, 8.28 (a, b), 8.35, 8.36).**(Turn 6)**

- Free hand sketching practice of Sectional Views using models and pictorial views. Figs. 8.72(3), (4), (9), (10), fig.4.62. **(Turn 7)**
- Drawing of sectional views. Fig 4.73, Sectional elevation, Plan and half Sectional side view - First Angle projection, Scale 2:1**(Turn 8, Sheet 3)**
- Drawing of Sectional Views, Fig. 8.55 (Sectional elevation, Plan and Sectional side View at 12 Dia. Hole - Third Angle projection) Use Proper Scale**(Turn 9, Sheet 4)**

Introduction to screw threads: forms of screw threads, designation, representation of threads (Use Fig. 15.5(a,b), 15.10, 15.15, 15.16). Drawing of Screw threads, Figs. 15.7 (BSW, Square, Acme, Buttress, Knuckle), 15.18, 15.19, 15.20 (Take D=20 mm). **(Turn 10, Sheet 5)**

- Nuts and Bolts: Drawing of Figs. 15.27, 15.31(b), 15.46 (a, b, c), 15.47 (d), (Assume suitable diameter) **(Turn 11, Sheet 6)**

Introduction to Riveted joints, rivets and riveting, type of rivets, types of riveted joints etc. Drawing of Rivets and Riveted joints. Figs. 13.6 (b), 13.12(a), 13.16 (Assume D=20 mm).**(Turn 12, Sheet 7)**

NOTE: All the figures referred above are from **Machine drawing** by Lakshminarayan and M.L.Mathur, fifth Reprint 2011.

FCC22B (PHY): PHYSICS LAB

2P **ETE: 50 marks, IA: 50 marks**

LIST OF EXPERIMENTS

1. To measure the numerical aperture of an optical fibre.
2. To convert a moving coils galvanometer into a voltmeter.
3. To converts moving coil galvanometer into an ammeter.
4. To study of the characteristics of a G.M counter
5. To study charging and discharging of a capacitor through a resistor.
6. To study phase relationship of voltages in a C-R and L-C-R A.C. circuit.
7. To study growth and decay of current in L-R circuit.
8. To determine the height of given object with the help of sextant.
9. To study the Hall Effect and determine the Hall Voltage and Hall coefficients.
10. To find wavelength of light by Newton's rings.
11. To determine wavelength of light with a transmission grating.
12. To find refractive index and dispersive power of material of prism by spectrometer.
13. To determine Planck's constant using a solar cell.

FCC 37B (ME): MECHANICAL LAB

2P **ETE: 50 marks, IA: 50 marks**

COURSE OUTCOMES:

CO1: Understand working cycles of diesel and petrol engines,various parts and their assemblies.

CO2: Summarize components of fuel supply systems, ignition system and their assemblies.

CO3: Evaluate the performance of Internal Combustion engine by engine testing.

CO4: Measure and draw valve timing diagram of four stroke diesel engine.

CO5: Understand the working of steam boiler and its mountings.

LIST OF EXPERIMENTS:

1. (a) To study various terminology used in IC engine with the help of models and diagrams.
   (b)To measure bore diameter, stroke length and clearance volume of a given BSA motor cycle petrol engine and find its compression ratio.
2. (a) To study basic components of four stroke cycle petrol engine and their working using models, working models and diagrams.
   (b) To study basic components of four stroke cycle Diesel engine and their working using models, working models and diagrams.
3. (a) To study basic parts of two stroke cycle petrol engine and their working using models and diagrams.
   (b) To study basic parts of two stroke cycle diesel engine and their working using models and diagrams.
4. To study Simple carburetor used in 2-wheelers using actual carburetor and diagrams.
5. To prepare layout of the fuel supply system of a diesel engine.
   a. To study construction feature and working of Diesel fuel pump.
   b. To study construction feature and working Diesel fuel injector.
6. To study conventional Battery ignition system used in earlier SI engines using models and diagrams and compare with magnetic pick-up type electronic ignition system in modern cars.
7. To measure and draw the valve timing diagram for a four stroke diesel engine.
8. To conduct a constant speed load test on diesel engine and calculate BHP, bsfc, mechanical efficiency and indicated power (using Willian's line method).
9. To study construction feature and working of a cross tube vertical cradley boiler.
10. To study following boiler mountings and accessories.
    Water level indicator, spring-loaded safety valve, fusible plug, pressure gauge, steam stop valve, feed check valve, Economiser.

FCC 38B (ME): WORKSHOP PRACTICE –II

2P **ETE: 50 marks, IA: 50 marks**

COURSE OUTCOMES:

CO1: Understand procedures of electric arc welding using various tools and equipment.

CO2: Demonstrate the use of tools and equipment to perform basic welding operation on a specimen.

CO3: Make Use of appropriate tools in forging processes to produce hexagonal headed bolt.

CO4: Understand various types of moulding sand and patterns utilized in casting processes.

CO5: Prepare the sand moulds using given patterns.

LIST OF EXPERIMENTS:

1. To study various tools and equipment used in Welding Shop.
2. To study various types of welding methods and also to study different types of weld joints.
3. To practice welding on mild steel flat using electric arc welding.
4. To study various tools used in Forging Shop.
5. To prepare hexagonal headed bolt using mild steel rod**.**
6. To study various moulding sands and tools used in Foundry Shop.
7. To study various types of patterns and their allowances.
8. To prepare moulds of given self-core pattern and split- pattern.

FCC39B (CSE): COMPUTER PROGRAMMING LAB

2P **ETE: 50 marks, IA: 50 marks**

CO1 Demonstrate the usage of various data types, operators, standard input-output functions and related C features in writing programs.

CO2 Implement conditional and iterative control flow structures for solving basic mathematical and logical problems.

CO3 Demonstrate the usage of functions and recursion for writing modular/reusable code.

CO4 Demonstrate the usage of non-primitive data types (arrays, strings, pointers, structures, and unions).

CO5 Apply the concepts of dynamic memory allocation and file handling to demonstrate data management in practical applications.

Important Note: Following list of programmes are provided as practice problems to cover most of the course outcomes and should be treated as a reference list only. Instructors and examiners may include other programs based on the underlying concepts.

S No. **Title of Program**

1) C Program to illustrate usage of printf() and scanf() function.
2) C Program to illustrate usage of different header files (stdio.h&conio.h).
3) C Program to perform arithmetic operations on various numerical and char data types.
4) C Program to illustrate the use of format specifiers in printf() and scanf() functions.
5) C Program to illustrate the size of int, float, double and char on user machine.
6) C Program to swap two numbers with and without using a temporary variable.
7) C Program to illustrate the concept of variable scoping and storage specifiers (e.g. static).
8) C Program to find the largest number among three numbers using conditional operator.
9) C Program to check for leap year.
10) C Program to check if a number is prime, palindrome or Armstrong based on user's choice (Hint: use switch-case).
11) C Program to check if parity of an integer is even or odd. (Hint: convert to binary first)
12) C Program to print various geometrical patterns (e.g. pyramid, right angle triangle, inverted triangle etc.) using nested loop statements.
13) C Program to find GCD and LCM of two numbers.
14) C Program to display prime numbers between intervals using function.
15) C Program to calculate the power of a number using recursion.
16) C Program to search a given element by using linear search in arrays.
17) C program to multiply two matrices using multi-dimensional arrays.
18) C Program to access elements of an array using pointers.
19) C Program to swap two numbers using call by reference.
20) C Program to illustrate use of various string functions (substring, case, compare etc.)
21) C Program to copy a string without using strcpy() function. (Hint: use malloc() function).
22) C Program to sort 10 words input by user in lexicographical order (Dictionary Order).
23) C Program to find if a substring exists in a string without using string library functions.
24) C Program to load information of a student in memory using structures.
25) C Program to add two complex numbers by passing structures to a function.
26) C Program to illustrate use of pointers to structures.
27) C Program to dynamically create and delete as many structure variables as user wants.
28) C Program to read and write a line from a text file.
29) C Program to store/read an array and a structure in/from a file.
30) C Program to use different types of macros.

FCC310B (ECE) BASIC ELECTRONICS LAB

2P **ETE: 50 marks, IA: 50 marks**

COs	**Cos details**
CO1	Understand the properties of Inductor, Capacitor & Resistors
CO2	To Understand V-1 characteristics of PN junction diode in forward and reverse bias condition.
CO3	To Understand V-1 characteristics of Zener diode and Light emitting diode.
CO4	To Understand V-I characteristics of Bipolar junction and Filed effect Transistors and SCR
CO5	To Design a Half wave, Full wave rectifier and bridge wave circuit.

List of Experiments:

1	Study of passive components like Inductor, capacitors and Resistors
2	Study the characteristics of forward bias diode and also calculate the static and dynamic resistance
3	Study the characteristics of reverse bias diode and also calculate the static and dynamic resistance
4	Study the characteristics of Zener Diode
5	Study the characteristics of LED (light emitting diode)
6	Study the characteristics of SCR
7	Study the characteristics of BJT
8	Study the characteristics of FET
9	Study the CRO (Cathode Ray Oscilloscope) and its operation
10	Study the Half wave Rectifier and find out V_{max}, V_{rms} and ripple factor
11	Study the full wave rectifier using two diodes and Centre tap to find out V_{max}, V_{av}, V_{rms} and ripple Factor
12	Study the Bridge wave rectifier using four diodes and find out V_{max}, V_{av}, V_{rms} and ripple factor

FCC23B (HSC) UNIVERSAL HUMAN VALUES AND COMMUNICATION SKILLS

2P **ETE: 50 marks, IA: 50 marks**

Unit – I: (Humanities)

Introduction: Aims, Objectives and Need, Importance of studying Social Sciences, Dynamics of Social Change; Political Concepts: Modern forms of Government; Indian Constitution, Making and Salient Features. Economics: Planning and Development (NITI Aayog); Public Policy and Engineering: Role and Importance. International Relations: International Cooperation in addressing Global Challenges and Conflict (Sustainable development goals); Impact of technological advancement on International relations; United Nations Organization.

Unit – II: (English)

Grammar Subject-Verb agreement, Articles, Prepositions, Active and Passive voice, Modal Auxiliaries, Direct and Indirect Narration, Tenses, Complex and Compound Sentences, Vocabulary Building Synonyms and antonyms, Idioms and phrases, one-word substitutions, prefixes and suffixes, Writing Skills Paragraph Writing, Report Writing (Scientific and technical reports), email writings, Memo, Business letters & Formal letters, Types of writing—Narrative, expository, evaluative and descriptive.

Unit – III: (Communication Skills)

a) Reading Skills— SQW3R Method (Survey-Questions Write -Recall-Review-Revise) Note-taking and Note making. Intensive and extensive reading
b) Listening Skills— Effective listening and barriers to active listening c) Speaking Skills— (Involves interactive practice sessions in Language Lab)

Professional Interaction—Group Discussion, Job Interviews, Formal Presentations,Communication at workplace

Unit – IV: (Universal Human Values – I)

Introduction to Value Education, Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Self-exploration as the Process for Value Education, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations. Harmony in the Human Being, Understanding Human being as the Co-existence of the Self and the Body, The Body as an Instrument of the Self Lecture, Harmony of the Self with the Body.

Unit – V: (Universal Human Values – II)

Harmony in the Family, Society&Nature, Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship

Implications of the Holistic Understanding – a Look at Professional Ethics, Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics.

Course Outcomes:

CO-1 Comprehend human behaviour and social change, various fundamentals ofIndian Constitution as well as aspects of policy making.
CO-2 Able to build a cross-cultural understanding of international events, imparting Englishlanguage.
CO-3 Get familiarwith communicative skills in professional interactions.
CO-4 Understand values, skills, self-exploration and harmony in self and body for right understanding.
CO-5 Get holistic and value based perspective towards life and profession,understanding harmony in family and nature.

Text / Reference Books:

1. Principles of Sociology with an Introduction to Social Thought, C. N. Shankar Rao,S.Chand
2. Dynamics of Social Change by Sujeetha T.N. et al-NPH Delhi.
3. Indian Government and Politics prof.B.L. Fadia,prof. KuldeepFadia -SahityaBhavan
4. Political Theory- Principles of Political Science,R.C. Agarwal, S .Chand
5. Planning And Economic Development by Dr. V.C. Sinha, Dr.SudhaPandeya- SBPD Publication
6. International Relations by IPS Shri Ashok Kumar , IPS Dr Rajesh Kumar Mohan- McGraw Hill
7. Advanced English Grammar by D. S Paul- Goodwill
8. Vocabulary Builder Work Book by Chris Lele -magsh
9. Advanced Writing Skills by D.S. Paul-Goodwill
10. Communication Skills 2E by Sanjay Kumar,PushpLata -Oxford Higher Education

11. A foundation Course in Human Values and Professional Ethics by R.R. Gaur, R.Sangal, G.P. Bagaria-Excel Books pvt ltd

FCC14B (HSC): ANANDAM

GRADE (O/A/B)

Anandam- An Exercise in Trusteeship

Not enjoyment, and not sorrow

Is our destined end or way;

But to act that each tomorrow

May find us farther than today.

1. **Objective of the Program**
   Anandam is an initiative to instil the joy of giving in young people, turning them into responsible citizens, who will build a better society. Daily action will build the habit of service in students of all UG and PG courses, who will have to undertake the course each semester.

2. **Course Category**
   Mandatory

3. **Structure**
   Over the course of the year. Students will be expected to engage in individual and group acts of service and goodness.

4. **Students will be expected to (Components of Anandam Programme)**
   - Engage in at least one act of kindness/individual service eachday.
   - Record this act of kindness/individual service in a register/personal diary dedicated to the purpose.
   - Share this register/personal diary in the Anandam Time slotassigned by the Department/Faculty/Centre/College.
   - Undertake one group service project for every term (outside college hours).
   - Submit the report on the group project to Anandam mentors.
   - Participate in presentations on the group service in the discussion sessions held.

5. **Inputs**
   A. From the University
   - An Anandam Committee to coordinate the Anandam Programme
   - Training for Faculty members on how to facilitate the Anandam program and on mentorship.
   - Anandam Committee will organize programs/activities/sessions for faculty members/students.

- A list of Anandam Mentors will be issued by the university administration. The mentors will be appointed from amongst the faculty members of the Faculty/Department/Centre.
- In the case of a college, the college administration will issue a list of Anandam Mentors. The mentors will be appointed from amongst the faculty members of the college.

B. From the Faculty/Centre/College/Department

- Faculty member (Anandam Mentor) will review every student's Register/PD to see if he/she has recorded the acts of goodness.
- The faculty will mentor the group service projects. They will strive to mobilize the required resources and support for the group service projects.
- Mentors to guide and review the student's activities.
- A list of suggested programs or places for volunteering (NGOs etc.) may be made available by faculty members.

6. Outcomes

Each student will finish the semester with a portfolio of giving. This will include their Register/Personal Diaries and their reports on group service projects.

7. Evaluation

The Anandam Curriculum will be a mandatory course. Students across all semesters are required to participate in group service projects. "Good" or "Satisfactory" remarks will be given for the successful completion of group projects and Anandam diaries, per semester. Kindly refer to point 7.1 for a detailed evaluation matrix.

Evaluation Matrix

Components per semester

- Register/Personal Diary
- Project Participation

Criteria	Remark in the Mark sheet
If Completed Both the Components	Good
If Completed any Single Component	Satisfactory
Not Undertaken a Single Component	_____

8. Rewards and Recognition

The students can submit their projects for an award and recognition at the college and university level. The projects will be reviewed and assessed by committees at the respective levels. Similarly, the mentors will be eligible for such recognition at the University level.