Schemes of Teaching and Examination
B.Tech. Program (I Year)
&
Syllabi of courses

Preamble

The University offers B.Tech. programs leading to Bachelor of Technology degree in 14 disciplines(**Table-1**). The Academic Departments offer courses to the students of various disciplines. Academic curricula are so devised that a student of one discipline can take some courses of other disciplines offering choice based credit system (CBCS). Such flexibility helps a student to develop his core competence together with the interdisciplinary skills in the area of his/her interest.

Table-1. B.Tech. Programs

S. No.	Department	Academic Program	Code
1.	Biotechnology	B. Tech. (Biotechnology)	BT
2.	Civil Engineering	B. Tech. (Civil Engineering)	CE
3.	Computer Science & Engineering	B. Tech. (Computer Science and Engineering)	CS
4.	Applied Chemistry	B. Tech. (Chemical Engineering)	CH
5.	Electrical Engineering	B. Tech. (Electrical Engineering)	EE
6.	Electronics & Communication Engineering	B. Tech. (Electronics & Communication Engineering)	EC
7.	Environmental Engineering	B. Tech. (Environmental Engineering)	EN
8.	Applied Physics	B. Tech. (Engineering Physics)	EP
9.	Information Technology	B. Tech. (Information Technology)	IT
10.	Mechanical Engineering	B. Tech. (Mechanical Engineering)	ME
11.	Mechanical Engineering	B. Tech. (Mechanical Engineering with specialization in Automotive Engineering)	AE
12.	Applied Mathematics	B. Tech. (Mathematics and Computing)	MC
13.	Mechanical Engineering	B. Tech. (Production and Industrial Engineering)	PE
14.	Software Engineering	B. Tech. (Software Engineering)	SE

Structure of four year B. Tech. program

The four year B. Tech. program compromises of courses divided in eight distinct areas, namely: Basic Sciences (BSC), Engineering Science (ESC), Departmental Core (DCC), Departmental Elective (DEC), Generic Elective (GEC), Ability Enhancement (AEC), Skill Enhancement (SEC) and value Addition Courses (VAC).

Basic Sciences and Mathematics Courses (BSC)

The Basic Sciences and Mathematics Courses consist of courses considered essential for a B.Tech. program to build the foundation for learning of engineering core courses.

Engineering Science Courses (ESC)

The students are required to complete a minimum number of engineering science courses offered by engineering departments other than his/her parent department. These courses expose the student with wide spectrum knowledge of allied engineering domain connected to the main engineering stream of the course of study of the students of concerned departments.

Discipline Specific Core Courses (DCC)

The departmental core consists of mandatory courses considered essential for a chosen engineering/science discipline including, engineering design, seminar, industrial training and project. The industrial training of duration 6-10 weeks shall be undertaken by every student in the summer vacation after sixth semester.

Skill Enhancement Courses (SEC)

Skill Enhancement Courses **(**SEC) are skill-based courses in all disciplines and are aimed at imparting hands-on-training, competencies, skills, etc to enhance the employability of the students.

Elective Courses

The students are required to complete a specific number of elective courses. Every department offers a wide variety of elective courses to students providing them opportunity to discover their academic interest and enhance their engagement in learning process. The elective courses are categorized as Departmental Elective Courses (DEC), Generic Elective Courses (GEC), Ability Enhancement Courses and Value Addition courses (VAC).

Discipline Specific Elective Courses (DEC)

A wide range of elective courses is available with each program. When a student opts elective courses offered in his/her program it will be termed as DEC.

Generic Elective Courses (GEC)

When student of a particular branch opts for a DEC/DCCs being offered by other departments this elective will be termed as Generic elective (GEC) for him/her.

To promote research, innovation and entrepreneurship among the undergraduate students three different tracks in elective courses are also offered namely (a) Research Project (b) Mini Project (c) Entrepreneurship and venture development.

Research Project (Elective)

A Student may register for the Research Project Elective Course of 04 credits in Fifth Semester against a DEC/GEC. The idea of this course is to develop analytical skills and critical thinking among the students. The outcome of the research would be considered for the award of credits based upon published work in journals as listed in details Guidelines. On successful completion of Research Project (Elective) a student shall be eligible for direct admission to PhD program after obtaining B.Tech degree provided he/she fulfils all the conditions outlined in notification no.F…105/Acad-PG/Admission/2020-21IRD/2818(A) regarding direct admission to PhD program for DTU full time B.Tech students.

Mini Project (Elective)

The aim of the mini project is to enable the students to apply knowledge to address real-world situations problems and find their solution. A student may register for a mini project elective in the fifth semester against DEC/ GEC courses. The students will be required to produce and present a working prototype at the end of the course.

Entrepreneurship and venture development (Elective)

The aim of the entrepreneurship and venture development track is to help students to build-up entrepreneurial skill and encourage the startup culture in the University. A student may register for this elective in fifth semester against a DEC/GEC.

Ability Enhancement Courses (AEC)

The AECs aim at enabling the students to acquire linguistic skills including critical reading and expository and academic writing skills with special emphasis on communication skills. These courses emphasize on the development and enhancement of skills such as communication, ability to participate/conduct discussion and debate.

Value Addition courses (VAC)

The VACs are value based courses which are meant to inculcate ethics, culture, constitution values, soft skill, sports education, environment Science/education and such similar values which will help in all round development of students.

Course Coding

A course is identified by a course code designated by a string of alpha-numeric characters and a course title. In a course code, first two letters of the string indicate the Academic Department/Program code offering the course and the last three numbers designate particular course.

Course Number

For all the courses, the first digit corresponds to the level (year) at which a course is normally offered. The last two digits denote the number of the course, which will usually be odd for courses offered in the Odd Semester and even for courses in the Even Semester. For example, the course, “Circuit and Field Theory”, offered to Electrical Engineering students in second semester ‘Even Semester’ is numbered as EE102.

Teaching Engagements

Every course maintains a teaching schedule for which weekly contact hours are decided for delivering lectures (L), engaging tutorials (T) and/or performing practicals(P) to make learning in a course more effective. In the syllabi, the information regarding number of course credits and contact hours per week is denoted as: **Credits (L – T – P); 4 (3 – 1–0).**

UG certificate : Students who opt to exit after completion of the first year and have secured 40 credits will be awarded a **UG certificate** if, in addition, they earn 6 credits through 2 months summer internship/ ITI level courses/skill based courses during the summer vacation of the first year. Also, these students will be allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years, subject to the condition that the concerned student will be allowed to exit and re-enter the degree program only once. Further, only students of DTU are allowed to re-enter the degree programme within the stipulated period.

Course Structure for B. Tech. Program (FIRST YEAR)

First Semester

Student Induction Program (SIP) An SIP of two weeks at the start of first semester, to prepare newly admitted undergraduate for the new stage of their life by facilitating a smooth transition from their home and school environment into the university environment, is mandatory for all the students.

S.No.	Subject	Credits	Category
1.	Mathematics-I	4	BSC
2.	Physics / Programming Fundamentals	4	BSC/ESC
3.	Interdisciplinary Core Course -1*	4	BSC/ESC
4.	Interdisciplinary Core Course –2*	4	BSC/ESC
5.	Skill Enhancement Course -1 (SEC-1) (Branch Specific)	2	SEC
6.	Ability Enhancement Course-1/Value Addition Course -1	2	AEC
	Total	20	

1. *Interdisciplinary Core Courses 1 and 2 shall be allocated from a common pool of Interdisciplinary BSC/ESC Courses.
2. Interdisciplinary Core Courses 1 and 2 in BSC/ESC pool shall be considered equivalent for the purpose of credit completion requirement for award of degree.

Second Semester

S.No.	Subject	Credits	Category
1.	Mathematics-II	4	BSC
2.	Programming fundamental /Physics	4	ESC/ BSC
3.	Interdisciplinary Core Course –3# (Branch Specific)	4	BSC/ESC
4.	Department Core Course -1	4	DCC
5.	Skill Enhancement Course -2 (SEC-2) (Branch Specific)	2	SEC
6	Ability Enhancement Course-2/Value Addition Course -2	2	AEC
	Total	20	

#Interdisciplinary Core Course-3 will be decided by the concerned department.

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

List of Interdisciplinary Core Courses 1 and 2

S.No.	Interdisciplinary Core Course (Abbreviation)	Offering Department
1.	Applied Chemistry (AC)	Applied Chemistry
2.	Basic Civil Engineering (BCE)	Civil Engineering
3.	Basic Electrical Engineering-1 (BEE I)	Electrical Engineering
4.	Basic Electrical Engineering -2 (BEE II)	
5	Basic Electronics and Communication Engineering (BEC)	Electronics & Communication Engineering
6.	Basic Mechanical Engineering (BME)	Mechanical Engineering
7.	Computer Aided Engineering Graphics-1 (EG-I)	
8.	Computer Aided Engineering Graphics-2 (EG-II)	

S.No.	Branch	Semester-1	
		Interdisciplinary Core Course -1	Interdisciplinary Core Course -2
1	Biotechnology	BEC	AC
2	Chemical Engineering	BEE-II	EG -I
3	Civil Engineering	BEE-II	BME
4	Computer Science and Engineering	BEC	EG-II
5	Electrical Engineering	BCE	EG -I
6	Electronics & Communication Engineering	BEE-II	AC
7	Environmental Engineering	BCE	AC
8	Engineering Physics	BEE-II	AC
9	Information Technology	BEC	BEE-I
10	Mechanical Engineering	BCE	BEE-I
11	Mechanical Engineering with specialization in Automotive Engineering	BCE	BEE-I
12	Mathematics and Computing	BEC	EG-II
13	Production and Industrial Engineering	BEE -II	AC
14	Software Engineering	BEC	BEE-I

S.No.	Branch	(Semester-2)	
		Interdisciplinary Core Course 3	**Discipline Specific Core Course 1**
1	Biotechnology	Biochemical Engineering Principles	Introduction to Biotechnology
2	Chemical Engineering	Mechanical Engineering Concepts for Chemical Engineers	Introduction to Chemical Engineering
3	Civil Engineering	Statistical Methods for Engineers	Mechanics of Solids
4	Computer Science and Engineering	Discrete Structures	Data Structures
5	Electrical Engineering	Data Structures and Algorithms	Circuit and Field Theory
6	Electronics & Communication Engineering	Data Structures and Algorithms	Network Analysis & Synthesis
7	Environmental Engineering	Environmental Awareness	Basic Environmental Engineering
8	Engineering Physics	Computational Methods	Fundamentals of Electrodynamics
9	Information Technology	Discrete Structures	Object Oriented Programming
10	Mechanical Engineering	Electronics and Communication concepts for Mechanical Engineers	Thermal Engineering-I
11	Mechanical Engineering Specialization in Automotive Engineering	Electronics and Communication concepts for Mechanical Engineers	Engineering Mechanics
12	Mathematics and Computing	Discrete Structure	Complex Analysis
13	Production and Industrial Engineering	Electronics and Communication concepts for Mechanical Engineers	Engineering Materials and Metallurgy
14	Software Engineering	Fundamentals of Computers	Fundamentals of Software Engineering

S.No.	Branch	**Skill Enhancement Courses**	
		SEC-1 (Sem-1)	SEC-2 (Sem-2)
1	Biotechnology	Applied Aquaculture	Development of Scientific Instrumentations and Its Applications
2	Chemical Engineering	Unit process in Chemical Synthesis-1	Unit process in Chemical Synthesis-1
3	Civil Engineering	Testing of Civil Engineering Materials	Engineering Graphics and Building Design

4	Computer Science and Engineering	Web Designing	Basics of Machine Learning & Applications
5	Electrical Engineering	Electrical Workshop	PCB Fabrication and Testing
6	Electronics & Communication Engineering	Electronics Workshop -1	Electronics Workshop -2
7	Environmental Engineering	Water and Wastewater Analysis	Air Pollution and Waste Management
8	Engineering Physics	Engineering Physics Workshop -1	Engineering Physics Workshop -2
9	Information Technology	Fundamentals of Web Design	Open Source Programming
10	Mechanical Engineering	Workshop Practice	Engineering Graphics
11	Mechanical Engineering with specialization in Automotive Engineering	Workshop Practice	Engineering Graphics
12	Mathematics and Computing	Python Programming	MATLAB Programming
13	Production and Industrial Engineering	Workshop Practice	Engineering Graphics
14	Software Engineering	Computer Workshop -1	Computer Workshop -2

BACHELOR OF TECHNOLOGY
(Chemical Engineering)
I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	EE105	Basic Electrical Engineering-II	ESC	4	3	0	2	3	0	15	25	20	40	-
4	ME101	Computer Aided Engineering Graphics-I	ESC	4	3	0	2	3	0	15	25	20	40	-
5	CH103	Unit Process in Chemical Synthesis-I	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/ 0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	CH102	Mechanical Engineering Concepts for Chemical Engineers	ESC	4	3	0	2	3	0	15	25	20	40	-
4	CH104	Introduction to Chemical Engineering	DCC	4	3	1	0	3	0	25	-	25	50	-
5	CH106	Unit Process in Chemical Synthesis-II	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/ 0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Mathematics and Computing

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics – I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	EC101	Basic Electronics & Communication Engineering	ESC	4	3	0	2	3	0	15	25	20	40	-
4	ME105	Computer Aided Engineering Graphics-II	ESC	4	3	0	2	3	0	15	25	20	40	-
5	MC103	Python Programming	SEC	2	0	0	4	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	MC102	Discrete Structure	ESC	4	3	1	0	3	0	25	-	25	50	-
4	MC104	Complex Analysis	DCC	4	3	1	0	3	0	25	-	25	50	-
5	MC106	MATLAB Programming	SEC	2	0	0	4	0	3	0	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Engineering Physics

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics – I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	EE105	Basic Electrical Engineering II	ESC	4	3	0	2	3	0	15	25	20	40	-
4	AC101	Applied Chemistry	BSC	4	3	0	2	3	0	15	25	20	40	-
5	EP103	Engineering Physics Workshop-I	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	EP102	Computational Methods	ESC	4	3	1	0	3	0	25	-	25	50	-
4	EP104	Fundamentals of Electrodynamics	DCC	4	3	1	0	3	0	25	-	25	50	-
5	EP106	Engineering Physics Workshop-II	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
(Biotechnology)
I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Applied Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	EC101	Basic Electronics & Communication Engineering	ESC	4	3	0	2	3	0	15	25	20	40	-
4	AC101	Applied Chemistry	BSC	4	3	0	2	3	0	15	25	20	40	-
5	BT 103	Applied Aquaculture	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	BT102	Biochemical Engineering Principles	ESC	4	3	1	0	3	0	25	-	25	50	-
4	BT104	Introduction to Biotechnology	DCC	4	3	1	0	3	0	25	-	25	50	-
5	BT 106	Development of Scientific Instrumentations and its applications	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Civil Engineering

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	EE105	Basic Electrical Engineering-II	ESC	4	3	0	2	3	0	15	25	20	40	-
4	ME107	Basic Mechanical Engineering	ESC	4	3	0	2	3	0	15	25	20	40	-
5	CE103	Testing of Civil Engineering Materials	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	CE102	Statistical Methods for Engineers	ESC	4	3	1	0	3	0	25	-	25	50	-
4	CE104	Mechanics of Solids	DCC	4	3	0	2	3	0	15	25	20	40	-
5	CE106	Engineering Graphics & Building Design	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Computer Science and Engineering

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO101	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	EC101	Basic Electronics & Communication Engineering	ESC	4	3	0	2	3	0	15	25	20	40	-
4	ME105	Computer Aided Engineering Graphics-II	ESC	4	3	0	2	3	0	15	25	20	40	-
5	CS103	Web Designing	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC -1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP102	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	CS102	Discrete Structure	ESC	4	3	1	0	3	0	25	-	25	50	-
4	CS104	Data Structures	DCC	4	3	0	2	3	0	15	25	20	40	-
5	CS106	Basics of Machine Learning & Applications	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Electrical Engineering
I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO101	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	CE101	Basic Civil Engineering	ESC	4	3	1	0	3	0	25	-	25	50	-
4	ME101	Computer Aided Engineering Graphics-I	ESC	4	3	0	2	3	0	15	25	20	40	-
5	EE 103	Electrical Workshop	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/ 0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP102	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	EE102	Data Structures and Algorithms	ESC	4	3	0	2	3	0	15	25	20	40	-
4	EE104	Circuit and Field Theory	DCC	4	3	0	2	3	0	15	25	20	40	-
5	EE106	PCB Fabrication and Testing	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/ 0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Electronics and Communication Engineering

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO101	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	EE105	Basic Electrical Engineering -II	ESC	4	3	0	2	3	0	15	25	20	40	-
4	AC101	Applied Chemistry	BSC	4	3	0	2	3	0	15	25	20	40	-
5	EC103	Electronics Workshop I	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/ 0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP102	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	EC102	Data Structures and Algorithms	ESC	4	3	0	2	3	0	15	25	20	40	-
4	EC104	Network Analysis & Synthesis	DCC	4	3	1	0	3	0	25	-	25	50	-
5	EC106	Electronics Workshop II	SEC	2	1	0	2	0	3	-	50	-	-	50
	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/ 0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Environmental Engineering

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	CE101	Basic Civil Engineering	ESC	4	3	1	0	3	0	25	-	25	50	-
4	AC101	Applied Chemistry	ESC	4	3	0	2	3	0	15	25	20	40	-
5	EN103	Water and Wastewater Analysis	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

I Year: Second Semester

1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	EN102	Environmental Awareness	ESC	4	3	1	0	3	0	25	-	25	50	-
4	EN104	Basic Environmental Engineering	DCC	4	3	1	0	3	0	25	-	25	50	-
5	EN106	Air Pollution and Waste Management	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Information Technology

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO101	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	EC101	Basic Electronics & Communication Engineering	ESC	4	3	0	2	3	0	15	25	20	40	-
4	EE101	Basic Electrical Engineering-I	ESC	4	3	0	2	3	0	15	25	20	40	-
5	IT103	Fundamentals of Web Design	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP102	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	IT102	Discrete Structures	ESC	4	3	1	0	3	0	25	-	25	50	-
4	IT104	Object Oriented Programming	DCC	4	3	0	2	3	0	15	25	20	40	-
5	IT106	Open Source Programming	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Mechanical Engineering

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	CE101	Basic Civil Engineering	ESC	4	3	1	0	3	0	25	-	25	50	-
4	EE101	Basic Electrical Engineering I	ESC	4	3	0	2	3	0	15	25	20	40	-
5	ME 103	Workshop Practice	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC -1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	ME102	Electronics and Communication concepts for Mechanical Engineers	ESC	4	3	0	2	3	0	15	25	20	40	-
4	ME104	Thermal Engineering-I	DCC	4	3	0	2	3	0	15	25	20	40	-
5	ME106	Engineering Graphics	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC-2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Mechanical Engineering with specialization in Automotive Engineering

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics -I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	CE101	Basic Civil Engineering	ESC	4	3	1	0	3	0	25	-	25	50	-
4	EE101	Basic Electrical Engineering I	ESC	4	3	0	2	3	0	15	25	20	40	-
5	AE103	Workshop Practice	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC -1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	AE102	Electronics and Communication concepts for Mechanical Engineers	ESC	4	3	0	2	3	0	15	25	20	40	-
4	AE104	Engineering Mechanics	DCC	4	3	0	2	3	0	15	25	20	40	-
5	AE106	Engineering Graphics	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC -2/VAC-2	AEC/ VAC	2	2/ 1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/2 5 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Production and Industrial Engineering

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	EE105	Basic Electrical Engineering- II	ESC	4	3	0	2	3	0	15	25	20	40	-
4	AC101	Applied Chemistry	BSC	4	3	0	2	3	0	15	25	20	40	-
5	PE103	Workshop Practice	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC -1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	PE102	Electronics and Communication concepts for Mechanical Engineers	ESC	4	3	0	2	3	0	15	25	20	40	-
4	PE104	Engineering Materials & Metallurgy	DCC	4	3	0	2	3	0	15	25	20	40	-
5	PE106	Engineering Graphics	SEC	2	1	0	2	0	3	-	50	-	-	50
6	AEC/ VAC	AEC- 2/VAC-2	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

BACHELOR OF TECHNOLOGY
Software Engineering

I Year: First Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (h)		Relative Weights (%)				
S. No.	Subject Code	Course Title	Subject Area	Credit	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	AM101	Mathematics - I	BSC	4	3	1	0	3	0	25	-	25	50	-
2	AP101	Physics	BSC	4	3	0	2	3	0	15	25	20	40	-
3	EC101	Basic Electronics & Communication Engineering	ESC	4	3	0	2	3	0	15	25	20	40	-
4	EE101	Basic Electrical Engineering -I	ESC	4	3	0	2	3	0	15	25	20	40	-
5	SE103	Computer Workshop-I	SEC	2	0	0	4	0	3	0	50	-	-	50
6	AEC/ VAC	AEC-1/VAC-1	AEC/ VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										
I Year: Second Semester														
1	AM102	Mathematics-II	BSC	4	3	1	0	3	0	25	-	25	50	-
2	CO102	Programming Fundamentals	ESC	4	3	0	2	3	0	15	25	20	40	-
3	SE102	Fundamentals of Computers	ESC	4	3	0	2	3	0	15	25	20	40	-
4	SE104	Fundamentals of Software Engineering	DCC	4	3	1	0	3	0	25	-	25	50	-
5	SE106	Computer Workshop –II	SEC	2	0	0	4	0	3	0	50	-	-	50
6	AEC/ VAC	AEC- 2/VAC-2	AEC / VAC	2	2/1 /0	0	0/2/ 4	3/3 /0	0/2 /3	25/ 15/0	0/25 /50	25/ 20/0	50/ 40/0	0/0 /50
	Total			**20**										

Additional 02 credits are to be earned from mandatory community engagement course in first year to fulfil the requirement of award of the four year B.Tech Degree.

Syllabi of Basic Sciences and Mathematics Courses (BSC)

Mathematics I

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
AM101: Mathematics I	3	1	0	NIL

Course Objective: To acquaint the students with the knowledge of series & sequence, single & multiple variable calculus, knowledge of vector calculus and their applications.

S. NO	Course Outcomes (CO)
CO1	Interpret the various types of series and their convergence.
CO2	Apply the differential and integral calculus of single variable in Taylor's expansion, radius of curvature, arc length etc.
CO3	Explain the various concepts of calculus of several variables like partial differentiation, total derivative etc. and apply them to various applications.
CO4	Explain the concept of multiple integrals and apply it to area and volume.
CO5	Interpret the various concepts of differential and integral calculus of vector point functions and apply them to work done by a force and in other applications.

S. NO	Contents	Contact Hours
UNIT 1	Infinite series: Tests for convergence of positive term series (Comparison, Ratio, nth Root, integral, Raabe's, Logarithmic), Alternating series, series, Absolute convergence, Conditional convergence.	8
UNIT 2	Differential & Integral Calculus of single variable: Maclaurin's and Taylor's Expansions, Radius of curvature, Tracing of some standard curves, Applications of definite integral to arc length and surface area (Cartesian and polar coordinates) .	8
UNIT 3	Calculus of several variables: Partial differentiation, Euler's theorem, Total derivative, Taylor's Expansion, Maxima-Minima, Lagrange's method of multipliers, Applications in estimation of error and approximation.	8
UNIT 4	Multiple Integrals: Double integral (Cartesian and polar co-ordinates), change of order of integration, triple integrals (Cartesian, cylindrical and spherical co-ordinates), Applications to area and volume.	9
UNIT 5	Vector Calculus: Scalar and vector point functions, gradient, directional derivative, divergence, curl and their interpretations. Line integral, surface integral and volume integral, Applications to work done by the force, Green's, Stoke's and Gauss divergence theorems.	9
	TOTAL	42

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Advanced Engineering Mathematics: kreyszig; Wiley-India, 10th edition ISBN- 978-1-119-45592-9	2020
2	Advanced Engineering Mathematics: Jain and lyenger; Narosa, 5th Edition ISBN-978-81-8487-560-7	2019

3	Advanced Engineering Mathematics: Alan Jeffery; Academic Press ISBN-978-93-80501-50-5	2010
4	Calculus and Analytic Geometry: Thomas and Finney; Narosa. ISBN-978-81-85015-52-1	2013
5	Advanced Engineering Mathematics: Dennis G. Zill, Jones and Bartee Publications 6th ed. ISBN-978-12844105902.	2016

Mathematics II

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
AM102: Mathematics II	**3**	**1**	**0**	**NIL**

Course Objective: To impart knowledge of matrices Differential equations, Laplace transform, Fourier series & their applications.

S. NO	Course Outcomes (CO)
CO1	Represent matrices, determinants, and techniques for solving systems of linear equations in the different areas of Linear Algebra, Describe Vector Space and its linear Independence. Solve Eigenvalue problems and apply Cayley Hamilton Theorem.
CO2	Explain the concept of differential equations and evaluate various methods to solve ordinary differential equations.
CO3	Extend the concept of series solutions to solve differential equations and check orthogonality for a given functions.
CO4	Implement the integral transformation using the concept of Laplace transformation and apply it to solve differential equations.
CO5	Solve initial and boundary values problems using Fourier series and Fourier transformations.

S. NO	Contents	Contact Hours
UNIT 1	Linear Algebra: Rank of a matrix, inverse of a matrix using elementary row transformations, solutions of system of linear equations, eigen values and eigen vectors of a matrix.	**8**
UNIT 2	Ordinary differential equations: Second and higher order linear differential equations with constant coefficients, General solution of homogenous and non-homogenous equations, method of variation of parameters, simultaneous linear differential equations.	**9**
UNIT 3	Special Functions: Power series method, Frobenious method, Legendre equation, Legendre Polynomials, Bessel equation, Bessel function of first kind and their Orthogonal property.	**9**
UNIT 4	Laplace Transforms: Basic properties, Laplace transform of derivatives and integrals, Inverse Laplace transform, Differentiation and Integration of Laplace transform, Convolution theorem, Unit step function, periodic function. Applications of Laplace transform to initial and boundary value problems.	**8**
UNIT 5	Fourier series: Fourier series of 2π period, Fourier series of arbitrary period, Fourier series of Even and odd functions, half range Fourier series, Harmonic analysis.	**8**
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Advanced Engineering Mathematics: kreyszig; Wiley-India, 10th edition ISBN- 978-1-119-45592-9	2020
2	Advanced Engineering Mathematics: Jain and lyenger; Narosa, 5th Edition ISBN- 978-81-8487-560-7	2019
3	Advanced Engineering Mathematics: Alan Jeffery; Academic Press ISBN- 978-93-80501-50-5	2010
4	Advanced Engineering Mathematics: Peter V. O'Neil Cengage Learning. ISBN-978-81-315-0310-2	2007
5	Advanced Engineering Mathematics: Dennis G. Zill, Jones and Bartee Publications 6th Ed. ISBN-978-12844105902.	2016

Applied Physics (AP)

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
AP101/102 Physics	3	0	2	NIL

Course Objective: The main objective of the course is using physics to solve scientific or engineering problems, thereby bridging the gap between physical science and technology. This course is aimed to offer broad areas of physics which are required as an essential background to engineering students.

S. NO	Course Outcomes (CO)
CO1	Explain special theory of relativity and apply its concepts in various fields of physics and engineering.
CO2	Apply concepts in interference, diffraction, and polarization to solve relevant numerical problems and to relate to relevant engineering applications.
CO3	Demonstrate the basic understanding of laser and optical fibre for gaining advanced knowledge in the field of optical communication and opto-electronics.
CO4	Demonstrate core theories of quantum mechanics and its impact on society.
CO5	Demonstrate principles of semiconductor physics. Apply gained knowledge of physics to general real-world situations.

S. NO	Contents	Contact Hours
UNIT 1	Relativity: Review of concepts of frames of reference, Michelson-Morley Experiment and its implications, Einstein's Special theory of relativity and its postulates, Lorentz transformation equations, law of addition of velocities, Concept of simultaneity, Length contraction, Time dilation, Mass variation with velocity, Concepts of energy and momentum, Mass energy relation.	8
UNIT 2	Physical Optics: Interference: Methods of formation of coherent sources, Parallel thin films, Wedge shaped film, Newton's rings. Diffraction: Fraunhofer diffraction, Single slit, Double slit and N-slit/ grating. Polarization: Phenomenon of double refraction, Nicol Prism, Production and analysis of plane, circularly and elliptically polarized light, Optical activity, Specific rotation.	10
UNIT 3	Lasers and Optical Fibres: Introduction to laser and its properties, Working principle of lasers, Spontaneous and stimulated emission, Einstein's coefficients, Ruby and He-Ne lasers. Classification of optical fibres, Core-cladding refractive index difference, Numerical aperture and pulse dispersion, V-number.	8

UNIT 4	Quantum Physics: Compton effect, Wave Particle Duality, de-Broglie relation, Davison and Germer Experiment, Postulates of Quantum Mechanics and introduction to wave function, Physical Significance of wave function- Probability density and normalization, Schrödinger wave Equation, Operators, Expectation values and eigen value equation, Particle in a Box, Concept of tunnelling.	**10**
UNIT 5	Semiconductor Physics: Origin of bands, Intrinsic and extrinsic semiconductors, Concept of Fermi level, Carrier concentration in intrinsic and extrinsic semiconductors, Drift, and diffusion current, Einstein Relation, Hall effect.	**6**
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Concept of Modern Physics by Arthur Beiser ,Mcgraw-Hill , 6th Edition,	2009
2	Optics, by A. Ghatak McGraw-Hill, 7th Edition,	2020
3	Fundamentals of Optics by Jenkins and White ,McGraw-Hill, 4th Edition,	2017
4	Solid state electronic devices by Streetman and Banerjee ,Pearson, 7th Edition	2015
5	Semiconductors physics & Devices by D. A. Neaman,McGraw-Hill, 4th Edition,	2015
6	Fundamentals of Physics by Halliday, Walker and Resnick, John Wiley & Sons, Inc., 12th Edition.	2021
7	Optics, by Brijlal and Subramaniyam, S Chand, 23rd Revised Edition,	2006

Applied Chemistry (AC)

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
AC101:Applied Chemistry	**3**	**0**	**2**	**NIL**

Course Objective: To familiarize the students with the concepts of engineering chemistry, material characterization and green chemistry.

S. NO	Course Outcomes (CO)
CO1	Describe the essential requirements of water and its importance in industry.
CO2	Differentiate between analytical methods.
CO3	Describe the basics of polymers, their applications in industry and recent advancements in the polymer field.
CO4	Apply the concepts of electrochemistry in energy storage devices.
CO5	Demonstrate the concepts of phase, component and degree of freedom, Gibb's phase rule.
CO6	Describe and apply the principles of green chemistry.

S. NO	Contents	Contact Hours
UNIT 1	Water Analysis: Titrimetric Analysis of Water (Alkalinity, Hardness, Dissolved Oxygen, Chlorine), Applications of Different Indicators, Theories of Indicators, Boiler Feed Water, Boiler Troubles and their Treatments.	8
UNIT 2	Analytical Methods UV-visible, IR: Principles and Applications. Thermo-gravimetry, Differential Thermal Analysis and Differential Scanning Calorimetry: Principles and Applications.	8
UNIT 3	Polymers: Functionality and Degree of Polymerization, Mechanism of Polymerization, Molecular Weights of Polymers, Conducting Polymers (Polyaniline, Polypyrrole, Polyacetylene) Industrial applications of Polymers.	8
UNIT 4	Electrochemistry: Primary and Secondary battery systems, Zinc-Carbon cells, Lead storage and lithium batteries. Fuel Cells, Recent Advancement in Batteries	6
UNIT 5	Phase Equilibrium: Definitions of Phase, component and degree of freedom, Gibb's phase rule. One component system: Water and sulphur. Two component systems: Pb-Ag and Cu-Ni.	8
UNIT 6	Green Chemistry: Principles of Green Chemistry; Numerical on atom economy; Examples of Green Methods of Synthesis, Reagents and Reactions, Evaluation of feedstock, Future trends in Green Chemistry.	4
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Thermal Analysis: Fundamentals and Applications to Polymer Science; T. Hatakeyama, F. X. Quinn, Wiley.	1999
2	Inorganic Quantitative Analysis; A. I. Vogel .	1951
3	Instrumental Methods of Analysis; Skoog D. A., HRW international.	1998
4	Engineering Chemistry; R. N. Goyal, H. Goel, Ane Books India.	2009
5	Engineering Chemistry; S. S. Dara, S. Chand.	2013
6	Polymer Science; V. Gowarikar, R. Sreedharan, New Age International.	2021
7	New Trends in Green Chemistry; V. K. Ahluwalia, M. Kidwai, Anamaya publication.	2004
8	Green Chemistry: Theory and Practice; P. T. Anastas, J. C. Warner, Oxford University Press	2000

Syllabi of Engineering Science Courses (ESC)

Programming Fundamentals				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
CO101/CO102: Programming Fundamentals	**L**	**T**	**P**	**Basic Mathematics**
	3	**0**	**2**	

Course Objective: The objective of the course is to understand the basic principles of programming languages and provide design & development basic programming skills. This course also introduces problem solving methods and program development.

S. NO	Course Outcomes (CO)
CO1	Design algorithmic solutions for use on computers. Approach the programming task using procedural and Object-Oriented Programming techniques.
CO2	Write constructs for console input and output, apply basic operators, and perform sequential Processing, utilize the basic control.
CO3	Apply decision structures, loops, storage class and functions.
CO4	apply data in arrays, pointers, and data files.
CO5	Develop effective and efficient programs in C and C++.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Concepts of algorithm, flow chart, Basics of Computer Languages, Compilers, Interpreter, Programming Environments and Debugging: types of errors and debugging techniques. Program design techniques: Structured, modular, Bottom-up, top-down, procedural, OOP Programming features: Data types, Expressions and Operators-Arithmetic, unary, logical, bitwise, relational, assignment, comma operators. Data conversions. Input/Output statements.	9
UNIT 2	Control statements: While, do-while, for statements, nested loops, if else, switch, break, Continue, and goto statements, Iterations. Concept of subprograms. Functions: Storage class -Scope and extent of variables, Argument types- actual, formal, dummy. Function definition, declaration, prototype. Recursion.	8
UNIT 3	Pre-processor directives: headers and library functions, macros. Array: Array representation, Operations on array elements, using arrays, multidimensional arrays. Strings, operations on strings. Structures & Unions: Declaration and usage of structures and Unions.	8
UNIT 4	Pointers: Pointer and address arithmetic, pointer operations and declarations, pointer and arrays, pointer to structure. Call by value, call by reference. Dynamic memory allocation. Sorting and searching algorithms: selection sort, bubble sort, insertion sort, and linear and binary search.	9
UNIT 5	File Handling: Declaration of files, types of files File pointer. File input/ output and usage, File operation Introduction to Object Oriented Programming: OOPS concepts, OOP languages- C++, Python etc.	8
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**

1	C Programming Language by Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall 2nd Edition. ISBN-13 - 978-0131103627	1988
2	C Programming for Beginners - The C Guru	2016
3	Let us C by Kanetkar, Y BPB Publications, 15th edition .	2016
4	Modern C by Jens Gustedt – Icube	2015
5	C Programming : The Ultimate Way to Learn The Fundamentals of The C Language by Harry. H. Chaudhary.	2014
6	Mastering C, Venugopal K R, Sudeep R Prasad, Edition 1,McGraw Hill Education. ISBN-13 : 978-9332901278	2017
7	Programming in ANSI C by E Balagurusamy , McGraw Hill Education (India) Private Limited Sixth Edition. ISBN-13 : 978-1259006821	2013
8	Conceptive C by Harry McGeough - Smashwords	2011

Basic Civil Engineering (BCE)

Course code: Course Title	Course Structure			Pre-Requisite
CE101: Basic Civil Engineering	**L**	**T**	**P**	**NIL**
	3	**1**	**0**	

Course Objective: To familiarize the students with the concepts of Civil Engineering and related applications.

S. NO	Course Outcomes (CO)
CO1	Describe about the basics of surveying, building construction and materials.
CO2	Describe the basic concepts of engineering mechanics.
CO3	Comprehend the idea about the different types of loadings and soil mechanics.
CO4	Relate water resources and environmental engineering in the real world scenario.
CO5	Apply ideas about the transportation engineering.

S. NO	Contents	Contact Hours
UNIT 1	Introduction and Scope of Civil Engineering, Principles & Types of Surveying, linear and angular measurements, levelling, Electronic surveying instruments etc., Components of Buildings & their functions. Types of buildings, Plinth area, carpet area, floor space index.	**8**
UNIT 2	Law of friction, angle of friction, angle of repose, law of machines, Mechanical advantage, and velocity ratio. Centre of gravity, Moment of inertia, polar moment of inertia, radius of gyration and moment of inertia of composite sections.	**8**
UNIT 3	Types of structures, Design Loads acting on the structure, Introduction to foundation, retaining wall and slopes. Shear and settlement criteria, allowable bearing capacity, Classification of soil.	**8**
UNIT 4	Introduction to Dam and Reservoirs, Design concepts of surface and sub drainage system, Water conservation, Quality of sources and their treatment requirement, basics of water supply systems, Chemical and Microbiological quality parameters, Drinking water quality criteria and standards.	**8**

UNIT 5	Classification of highways, Classification of pavements, Fundamentals of traffic flow and transportation planning, Elements of Traffic Engineering and Traffic Control, Intelligent Transport Systems.	**8**
	TOTAL	**40**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Basic Civil Engineering, B.C. Punmia, Laxmi Publications ISBN-13:9788170084037	2003
2	Basic Applied Soil Mechanics, Gopal Ranjan and A S R Rao, New Age International(P) Limited Publishers ISBN-81-224-1223-8	2005
3	Water Supply Engineering (Environmental Engineering), S.K. Garg, Khanna Publishers ISBN: 9788174091208	2010
4	Hydrology and Water Resource Engineering. K.C. Patra, Narosa Publishing House (ISBN 0-07-06472-59-8)	2002
5	Introduction to Transportation Engineering by James H. Banks, Tata Mc-Graw Hill, New Delhi ISBN-13:978-0-07-070246-2	2010
6	Strength of Materials by S S Rattan , McGraw Hill, ISBN: 978-9385965517	2017
7	Engineering Mechanics, S Timoshenko, J V Rao, Sukumar Patil, Tata Mc-Graw Hill, New Delhi ISBN-13:978-1259062667	2017

Basic Electrical Engineering-1 (BEE I)

Course code: Course Title	Course Structure			Pre-Requisite
EE101: Basic Electrical Engineering-I	**L**	**T**	**P**	**NIL**
	3	**0**	**2**	

Course Objective: To familiarize the students with the concepts of electrical circuits, magnetic circuits, transformer and measuring instruments.

S. NO	Course Outcomes (CO)
CO1	Classify different types of sources, properties of electrical elements, solve DC networks using various techniques and theorems.
CO2	Analyze performance of single-phase AC circuits with help of phasor diagrams, apply the knowledge to explain phenomenon of resonance in series and parallel circuit.
CO3	Analyze and evaluate power in a balanced three phase AC circuit.
CO4	Solve magnetic circuits, and apply its concepts to understand the operation of single-phase transformer.
CO5	Describe the operation and working of various analog and digital electrical measuring instruments.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Role and importance of circuits in Engineering, concept of fields, charge, current, voltage, energy, and their interrelationships. V- I characteristics of ideal voltage and ideal current sources, various types of controlled sources, passive circuit components, V-I characteristics and ratings of different types of R, L, C elements. DC Network: Series and parallel circuits, power and energy, Kirchhoff's Laws, delta-star transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Tellegen's theorem.	10
UNIT 2	Single Phase AC Circuits: Single phase emf generation, average and effective values of sinusoids, complex representation of impedance, series and parallel circuits, concept of phasor, phasor diagram, power factor, complex power, real power, reactive power and apparent power, resonance in series and parallel circuits, Q-factor, bandwidth and their relationship, half power points.	10
UNIT 3	Three-Phase AC Circuits: Three phase emf generation, delta and star connection, line and phase quantities, solution of three phase circuits: balanced supply and balanced load, phasor diagram, three phase power measurement by two wattmeter method.	5
UNIT 4	Magnetic Circuits and Transformers: Ampere's circuital law, B-H curve, concept of reluctance, flux and mmf, analogies between electrical and magnetic quantities, solution of magnetic circuits, hysteresis and eddy current losses, mutual inductance and dot convention, single phase transformer – construction and principle of working, auto transformers and their applications.	12
UNIT 5	Measuring Instruments: Analog indicating instruments, PMMC ammeters and voltmeters, damping in indicating instruments, shunt and multipliers, moving iron ammeter and voltmeters, dynamometer type instruments, multimeters, AC watt-hour meters. Digital voltmeters, ammeters, and wattmeters.	5
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Linear Circuit Analysis: Time, Domain, Phasor and Laplace Transform Approaches Raymond A. De Carlo, Pen-Min Lin, Oxford University Press, 2nd Edition.	2001
2	Basic Electrical Engineering, A.E. Fitzgerald, D. Higginbotham, Arvin Grabel, Tata McGraw-Hill Publishing Company; 5th Edition.	2009
3	Introduction to Electrical Engineering, Mulukutla S. Sarma, Oxford University Press	2001
4	Electrical and Electronic Technology, Edward Hughes, Pearson Education, 10th Edition.	2010
5	Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N.O. Sadiku	2022
6	Electrical Engineering Fundamentals, V. Del Toro, Pearson Education, 2nd Edition.	2015
7	Basic Electrical Engineering, C.L. Wadhwa, New Age International Pvt Ltd Publishers	2007

Basic Electrical Engineering -2 (BEE II)

Course code: Course Title	Course Structure	Pre-Requisite

EE105: Basic Electrical Engineering-II	L	T	P	NIL
	3	0	2	

Course Objective: To familiarize the students with the concepts of electrical circuits, magnetic circuits, transformer and rotating electrical machines.

S. NO	Course Outcomes (CO)
CO1	Classify different types of sources, properties of electrical elements, solve DC networks using various techniques and theorems
CO2	Analyze performance of single-phase AC circuits with help of phasor diagrams, apply the knowledge to explain phenomenon of resonance in series and parallel circuit
CO3	Analyze and evaluate power in a balanced three phase AC circuit
CO4	Solve magnetic circuits, and apply its concepts to understand the operation of single-phase transformer
CO5	Describe the principles and working of various kinds of rotating electrical machines.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Role and importance of circuits in Engineering, concept of fields, charge, current, voltage, energy and their interrelationships. V- I characteristics of ideal voltage and ideal current sources, various types of controlled sources, passive circuit components, V-I characteristics and ratings of different types of R, L, C elements. DC Network: Series and parallel circuits, power and energy, Kirchhoff's Laws, delta-star transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Tellegen's theorem.	10
UNIT 2	Single Phase AC Circuits: Single phase emf generation, average and effective values of sinusoids, complex representation of impedance, series and parallel circuits, concept of phasor, phasor diagram, power factor, complex power, real power, reactive power and apparent power, resonance in series and parallel circuits, Q-factor, bandwidth and their relationship, half power points.	8
UNIT 3	Three-Phase AC Circuits: Three phase emf generation, delta and star connection, line and phase quantities, solution of three phase circuits: balanced supply and balanced load, phasor diagram, three phase power measurement by two wattmeter method.	4
UNIT 4	Magnetic Circuits and Transformers: Ampere's circuital law, B-H curve, concept of reluctance, flux and mmf, analogies between electrical and magnetic quantities, solution of magnetic circuits, hysteresis and eddy current losses, mutual inductance and dot convention, single phase transformer – construction and principle of working, auto transformers and their applications.	10
UNIT 5	Rotating Electrical Machines: DC Machines, induction machines, synchronous machines, and special electrical machines.	10
	TOTAL	**42**

REFERENCES		
S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint

1	Linear Circuit Analysis: Time, Domain, Phasor and Laplace Transform Approaches Raymond A. De Carlo, Pen-Min Lin, Oxford University Press, 2nd Edition.	2001
2	Basic Electrical Engineering, A.E. Fitzgerald, D. Higginbotham, Arvin Grabel, Tata McGraw-Hill Publishing Company; 5th Edition.	2009
3	Introduction to Electrical Engineering, Mulukutla S. Sarma, Oxford University Press	2001
4	Electrical and Electronic Technology, Edward Hughes, Pearson Education, 10th Edition.	2010
5	Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N.O. Sadiku	2022
6	Electric Machinery by A Fitzgerald, Charles Kingsley, Stephen Umans	2017
7	Basic Electrical Engineering, C.L. Wadhwa, New Age International Pvt Ltd Publishers	2007

Basic Electronics and Communication Engineering (BEC)

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
EC101: Basic Electronics and Communication Engineering	**3**	**0**	**2**	**NIL**

Course Objective: The objective of the course is to familiarize the students with the fundamentals of analog electronic devices and circuits, digital circuits and schemes for analog and digital communications.

S. NO	Course Outcomes (CO)
CO1	Explain the principles of operation of semiconductor devices such as diode, BJT, JFET and MOSFET.
CO2	Design and analysis of CE-amplifier using small signal hybrid-pi model.
CO3	Simplify logic expression using Boolean law, Skills to minimize logic expression using k-map and design of various combinational and sequential logic circuits.
CO4	Explain the concepts of various Analog modulation schemes.
CO5	Illustrate the concepts of various Digital modulation schemes

S. NO	Contents	Contact Hours
UNIT 1	PN junction diode, V-I characteristics, Half wave and full wave rectifiers, Clipping and Clamping circuits, Zener diode as a voltage regulator.	6
UNIT 2	Bipolar Junction Transistor: Physical operation, CB, CC, CE Characteristics, operating point, load line, DC biasing circuit: Self Bias. Common emitter amplifier: Small signal model (Hybrid Pi-model), Current gain, voltage gain, input/output Impedance. Introduction to JFET and MOSFET: Structure and Characteristics.	12
UNIT 3	Digital circuits: Boolean algebra, Logic gates, K map up to 4 variables, Binary Adder and subtractor, MUX and DMUX, Flip flops: SR, JK, D, T.	10
UNIT 4	Basic Block Diagram of Analog Communication system, Concepts of Analog modulation Schemes: AM, FM, PM.	6

UNIT 5	Basic Block Diagram of Digital Communication system, Concepts of Sampling, Pulse code modulation, Concepts of Digital modulation Schemes: ASK, FSK, PSK.	8
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Electronic Devices and Circuit Theory, 7th Edition, Robert Boylestad, Louis Nashelsky. Prentice Hall.	1998
2	Digital Design, 4th Edition, M. Morris Mano, Pearson Education.	2006
3	Modern Analog and Digital Communication, 3rd Edition, B.P. Lathi, Oxford.	1998
4	Communication Systems, 4th Edition, Haykin, Simon, John Wiley & Sons.	2006

Basic Mechanical Engineering (BME)

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
ME107:Basic Mechanical Engineering	**3**	**1**	**0**	**NIL**

Course Objective: The oobjective of the course is to familiarize the students with the concepts of thermodynamics, fluid mechanics, power plants, engineering materials, manufacturing processes and metrology.

S. NO	Course Outcomes (CO)
CO1	Describe the basic concepts of thermodynamics / fluid mechanics and engineering materials
CO2	Describe the principle of first and second law of thermodynamics and laws of fluid mechanics & engineering materials.
CO3	Apply TD & FM Laws.
CO4	Apply manufacturing processes for various machining elements & machining processes
CO5	Analyze thermal power generation and power plants.
CO6	Analyze measuring instruments and gauges.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Introduction to Thermodynamics, Concepts of systems, control volume, state, properties, equilibrium, quasi-static process, reversible & irreversible process, cyclic process. Zeroth Law and Temperature, Ideal Gas. Heat and Work.	**6**

UNIT 2	First Law of Thermodynamics for closed & open systems. Non-Flow Energy Equation. Steady State, Steady Flow Energy Equation. Second Law of Thermodynamics-Kelvin and Plank's Statements, Clausius inequality, Definition of Heat Engines, Heat pumps, Refrigerators. Concept of Energy and availability. Carnot Cycle; Carnot efficiency, Otto, Diesel, Dual cycle and their efficiencies.	**6**
UNIT 3	Principles of power production, basic introduction about thermal power plant, hydroelectric power plant and nuclear power plant.	**6**
UNIT 4	Properties & Classification of Fluids, Ideal & real fluids, Newton's law of viscosity, Pressure at a point, Pascal's law, Pressure variation in a static fluid, General description of fluid motion, stream lines, continuity equation, Bernoulli's equation, Steady and unsteady flow.	**6**
UNIT 5	Introduction to engineering materials for mechanical construction. Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminium and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials	**6**
UNIT 6	Introduction to Manufacturing processes for various machine elements. Introduction to Casting & Welding processes. Sheet metal and its operations. Introduction to machining processes – turning, milling, shaping, drilling and boring operations. Fabrication of large and small assembles – examples nuts and bolts, turbine rotors etc.	**6**
UNIT 7	Introduction to quality measurement for manufacturing processes; standards of measurements, line standards, end standards, precision measuring instruments and gauges: Vernier calliper, height gauges, micrometre, comparators, dial indicator, and limit gauges.	**6**
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Engineering Thermodynamics, P. K. Nag, Tata McGraw-Hill	2017
2	Fundamentals of Classical Thermodynamics, G. J. Van Wylen and R. E. Santag	1994
3	Manufacturing Processes, Kalpakjianm, 6th Edition	2018
4	Basic Mechanical Engineering,1/e, Pravin Kumar, Pearson Education, Delhi	2018
5	Introduction to Fluid Mechanics and Fluid Machines, S. K. Som and G. Biswas	2017
6	Fluid Mechanics and Hydraulic Machines, R. K. Bansal	2010
7	Workshop Practices, K. Hazara Chowdhary	2009
8	Workshop Technology, W. A. J. Chapman	972
9	Production Engineering, R. K. Jain, Khanna Publishers	2001

Computer Aided Engineering Graphics-1 (EG-I)

Course code: Course Title	Course Structure			Pre-Requisite
ME101:Computer Aided Engineering Graphics-I	**L**	**T**	**P**	**NIL**

Engineering Graphics-I	3	0	2

Course Objective: The students will be prepared for the effective technical conversationand spatial visual expects of technical drawing. The students will be familiarized with drafting and engineering drawing practices with CAD for emerging digital era.

S. NO	Course Outcomes (CO)
CO1	Describe the principles and uses of Engineering Graphics. Also, students will learn rules of dimensioning, lettering, scales, types of projections, different planes used in projections. Students will be able to draw projections of point's lies in different quadrants. Also they will understand and obtain traces, true lengths shortest length and true angles with horizontal, vertical and auxiliary planes.
CO2	Draw projections of plane surfaces of different shapes. They will also draw the traces of plane surfaces.
CO3	Differentiate types of solids and projections and sections of solids which axis parallel, perpendicular and inclined to horizontal planes. Students will be able to learn application of development of surfaces and draw development of different types of surfaces.
CO4	Draw isometric projections and visualise orthographic projection of solids with different shapes.
CO5	Describe basic commands of 2D drawing with AutoCAD.
CO6	Transform the projections through AutoCAD.

S. NO	Contents	Contact Hours
UNIT 1	Introduction of Engineering Graphics and its significance, B.I.S. Specification, Dimensioning, Lettering, Different types of Projections, symbols used for lines and electrical engineering. Planes of projection, Reference and auxiliary planes, Projections of points and lines.	**7**
UNIT 2	Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes. Classification of solids, Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.	**7**
UNIT 3	Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections such as Prism, Cylinder, Pyramid, and Cone. Development of surfaces for various regular solids such as Prism, Cylinder, Pyramid and Cone.	**7**
UNIT 4	Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids. Sketching of Orthographic views from pictorial views and vice –versa, Sectional views.	**7**
UNIT 5	Introduction to AutoCAD: Basic commands for 2D drawing: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dimension style, etc. Managing layers and object properties. Layout management, Plot setting, Create and manage dimension.	**7**
UNIT 6	Transformation of Projections: Conversion of Isometric Views to Orthographic Views and Vice-Versa in AutoCAD. Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form.	**7**
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Warren J. Lucadder," Fundamentals of Engg. Drg., Pren. Hall, N. Delhi.	1976
2	N.D. Bhatt, Elementary Engineering Drawing., Charotar Publiction; 54th Edition 2023	2023
3	P.S. Gill," A Text Book of Geometrical Drawing., Katson Pub. Housing, Ludhiana. 2013th edition	2013
4	Jim Bethune and David Byrnes, Engineering Graphics with AUTOCAD 2023	2023
5	D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, Engineering Graphics with AutoCAD, PHI Learning Pvt. Ltd., 2009	2009

Computer Aided Engineering Graphics-2 (EG-II)

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
ME105:Computer Aided Engineering Graphics-II	**3**	**0**	**2**	**NIL**

Course Objective: The students will be prepared for the effective technical conversationand spatial visual expects of technical drawing. The students will be familiarized with drafting and engineering drawing practices with CAD for emerging digital era.

S. NO	Course Outcomes (CO)
CO1	Describe the principles and uses of Engineering Graphics. Also, students will learn rules of dimensioning, lettering, scales, types of projections, different planes used in projections. Students will be able to draw projections of point's lies in different quadrants. Also they will understand and obtain traces, true lengths shortest length and true angles with horizontal, vertical and auxiliary planes.
CO2	Draw projections of plane surfaces of different shapes. They will also draw the traces of plane surfaces.
CO3	Differentiate types of solids and projections and sections of solids which axis parallel, perpendicular and inclined to horizontal planes. Students will be able to learn application of development of surfaces and draw development of different types of surfaces.
CO4	Draw isometric projections and visualise orthographic projection of solids with different shapes.
CO5	Describe basic commands of 2D drawing with AutoCAD.
CO6	Transform the projections through AutoCAD.

S. NO	Contents	Contact Hours
UNIT 1	Introduction of Engineering Graphics and its significance, B.I.S. Specification, Dimensioning, Lettering, Different types of Projections, symbols used for lines and electrical engineering. Planes of projection, Reference and auxiliary planes, Projections of points and lines.	**7**
UNIT 2	Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes. Classification of solids, Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.	**7**
UNIT 3	Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections such as Prism, Cylinder, Pyramid, and Cone. Development of surfaces for various regular solids such as Prism, Cylinder, Pyramid and Cone.	**7**

UNIT 4	Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids. Sketching of Orthographic views from pictorial views and vice –versa, Sectional views.	**7**
UNIT 5	Introduction to AutoCAD: Basic commands for 2D drawing: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dimension style, etc. Managing layers and object properties. Layout management, Plot setting, Create and manage dimension.	**7**
UNIT 6	Transformation of Projections: Conversion of Isometric Views to Orthographic Views and Vice-Versa in AutoCAD. Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form.	**7**
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Warren J. Luzadder," Fundamentals of Engg. Drg., Pren. Hall, N. Delhi.	1946
2	N.D. Bhatt, Elementary Engineering Drawing., Charotar Publiction; 54th Edition 2023	2023
3	P.S. Gill," A Text Book of Geometrical Drawing., Katson Pub. Housing, Ludhiana. 2013th edition	2013
4	Jim Bethune and David Byrnes, Engineering Graphics with AUTOCAD 2023	2023
5	D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, Engineering Graphics with AutoCAD, PHI Learning Pvt. Ltd., 2009	2009

B. Tech. Biotechnology				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
BT102: Biochemical Engineering Principles	**L**	**T**	**P**	**NIL**
	3	**1**	**0**	

Course Objective: To introduce the key aspects associated with biochemical processes and calculation techniques used in reactor designing and to acquaint the students with fundamentals of the different reaction systems.

S. NO	Course Outcomes (CO)
CO1	Describe the Microbial Process Principles such as Microbial growth curve and biomass yield. Compare and Contrast the Energetics of the cells.
CO2	Analyse the Mathematical modelling and kinetics of microbial growth such as Substrate utilization, Product formation and Plasmid Instability.
CO3	Identify the Sterilization Principles and mechanism of media, air sterilization along with thermal death kinetics of microorganism.
CO4	Distinguish the different types of Bioreactors, its design and working conditions, and understand the homogeneous and heterogeneous reaction system.
CO5	Describe the Instrumentation and Control of Biochemical process variables, their measurements, control principles and their application in bioreactors.

S. NO	Contents	Contact Hours
UNIT 1	Microbial Process Principles: Microbial growth; Synchronous culture, Biomass yield; Energetics of the cells.	8
UNIT 2	Kinetics of Microbial Growth, Substrate Utilization and Product Formation: Mathematical modelling of microbial growth; Substrate utilization and product formation kinetics; plasmid Instability.	9
UNIT 3	Sterilization: Principles and mechanism of media sterilization. Thermal death kinetics, Air sterilization.	8
UNIT 4	Bioreactor Design and Analysis: Bioreactor configuration, Bioreactor design and optimum operations, Basic concept of scale-up of bioreactors, Introduction to design of homogeneous & heterogeneous reaction system	9

UNIT 5	Instrumentation and Control: Biochemical process variables and their measurements, Control principles and their application in bioreactors.	8
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Introduction to Biochemical Engineering; D. G. Rao, Tata McGraw-Hill Education.	2009
2	Bioprocess Engineering Principles; P. Doran, Elsevier Science.	2013
3	Principles of fermentation technology; Stanbury and Whitaker, Elsevier Science.	2016
4	Chemical reaction engineering; O. Levenspiel, John Wiley and sons Inc.	1999
5	Coulson's and Richardson's Chemical Engineering; J. F. Richardson, D. G. Peacock Publisher: Asian books.	1994

B. Tech. Chemical Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
CH102: Mechanical Engineering Concepts for Chemical Engineers	**3**	**1**	**0**	**NIL**

Course Objective: To familiarize the students with the concepts of thermodynamics, fluid mechanics, power plants, engineering materials, manufacturing processes and metrology.

S. NO	Course Outcomes (CO)
CO1	Describe the basic concepts of thermodynamics / fluid mechanics and engineering materials
CO2	Descibe the principle of first and second law of thermodynamics and laws of fluid mechanics & engineering materials.
CO3	Describe application of TD & FM Laws.
CO4	Apply manufacturing processes for various machining elements & machining processes.
CO5	Analyze thermal power generation and power plants.
CO6	Analyze measuring instruments and gauges.

S. NO	Contents	Contact Hours

UNIT 1	Introduction: Introduction to Thermodynamics, Concepts of systems, control volume, state, properties, equilibrium, quasi-static process, reversible & irreversible process, cyclic process. Zeroth Law and Temperature, Ideal Gas. Heat and Work.	**6**
UNIT 2	First Law of Thermodynamics for closed & open systems. Non-Flow Energy Equation. Steady State, Steady Flow Energy Equation. Second Law of Thermodynamics-Kelvin and Plank's Statements, Clausius inequality, Definition of Heat Engines, Heat pumps, Refrigerators. Concept of Energy and availability. Carnot Cycle; Carnot efficiency, Otto, Diesel, Dual cycle and their efficiencies.	**6**
UNIT 3	Principles of power production, basic introduction about thermal power plant, hydroelectric power plant and nuclear power plant.	**6**
UNIT 4	Properties & Classification of Fluids, Ideal & real fluids, Newton's law of viscosity, Pressure at a point, Pascal's law, Pressure variation in a static fluid, General description of fluid motion, stream lines, continuity equation, Bernoulli's equation, Steady and unsteady flow.	**6**
UNIT 5	Introduction to engineering materials for mechanical construction. Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminium and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials	**6**
UNIT 6	Introduction to Manufacturing processes for various machine elements. Introduction to Casting & Welding processes. Sheet metal and its operations. Introduction to machining processes – turning, milling, shaping, drilling and boring operations. Fabrication of large and small assembles – examples nuts and bolts, turbine rotors etc.	**6**
UNIT 7	Introduction to quality measurement for manufacturing processes; standards of measurements, line standards, end standards, precision measuring instruments and gauges: Vernier calliper, height gauges, micrometre, comparators, dial indicator, and limit gauges.	**6**
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Engineering Thermodynamics; P. K. Nag, Tata McGrawa-Hill	2017
2	Fundamentals of Classical Thermodynamics; G. J. Van Wylen, R. E. Santag.	1994

3	Manufacturing Processes; Kalpakjian.	2018
4	Basic Mechanical Engineering; 1/e, Pravin Kumar, Pearson Education, Delhi	2018
5	Introduction to Fluid Mechanics and Fluid Machines, S. K. Som and G. Biswas	2017
6	Fluid Mechanics and Hydraulic Machines, R. K. Bansal	2010
7	Workshop Practices, K. Hazara Chowdhary	2009
8	Workshop Technology, W. A. J. Chapman	972
9	Production Engineering, R. K. Jain, Khanna Publishers	2001

B. Tech. Civil Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
CE102: Statistical Methods for Engineers	3	1	0	**NIL**

Course Objective: The objective of the course is to use and understand the principal numeric and graphical techniques to display and summarize Experimental/ Engineering/ Natural phenomena /economical data and to discuss and explain how statistics can be used to interpret the results. Also, the course aims to understand the common statistical techniques and terminology used in various studies that are presented in the various reports and journals.The course helps in designing sampling requirements and organize the data for appropriate statistical analysis/modelling and train students with essential tools for statistical analyses and fostering understanding through real-world statistical applications, and to familiarize with the common probability distributions.

S. NO	Course Outcomes (CO)
CO1	Generate stem & leaf plot and box plot and differentiate various aspects of data in term of central tendency, dispersion, Asymmetric and peakedness.
CO2	Describe various aspects of normal distributions and to estimate confidence intervals in relation to level of significance. To test the data for normal distribution assumption and for identification of outliers.
CO3	Develop of null and alternative hypothesis and to perform test of Hypothesis.
CO4	Apply regression/correlation technique for drawing statistical inference about the underline causative phenomena.

CO5	Generate simple univariate time series models and analyze the errors in the model by carrying out analysis of residuals.

S. NO	Contents	Contact Hours
UNIT 1	Primary & Secondary data, Collection of data, Source of secondary data; Methods of Sampling, Random sampling, Table of Random numbers and its uses, Stratified sampling. Frequency distribution, discrete grouped and continuous data, graphical depiction of data, stem and leaf plot, Box plot. Concept of Mathematical expectation, Measure of central tendency, moments, variance, standard deviation and Coefficient of variation, measure of Asymmetric and peakedness.	**8**
UNIT 2	Binomial distribution (for discrete data), Means and standard deviation of binomial distribution. Normal distribution (for continuous data), Probability density function of normal distribution, standardized normal distribution, Estimating the population mean using 'Z' statistic, Estimation of confidence intervals in relation to level of significance, solving normal curve problems.	**9**
UNIT 3	Sampling theory and sampling distributions, test of significance for large samples, Testing of hypothesis, Null hypothesis, Alternate hypothesis, Level of significance, Type I and Type II errors, one tailed and two tailed test, testing the difference of means of two samples. Probability plotting for normal distribution, Identification, and accommodation of outliers.	**9**
UNIT 4	Causation Versus Correlation, Types of correlation, positive and negative correlation, linear and non-linear correlation, Pearson coefficient, Simple regression analysis , Curve fitting by method of least square, Residual analysis, Standard error of estimate, coefficient of determination, goodness of fit using MAE,RMSE, MAPE.	**8**
UNIT 5	Stochastic variables, Time series data, stationary series, Introduction to Box Jenkins modeling, auto correlation function, Auto Regressive model development for a given univariant time series data.	**8**
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Mathematical Statistics, John E. Freund and R. Mohan, Pearson,8th Edition (2015)	2015

2	Statistics for Management, Richard I. Levin, David S. Rubin, Masood H Siddiqui & SanjayRastogi, Pearson,8th Edition (2017)	2017
3	Probability and Statistics for Engineers, Richard L. Scheaffer, Madhuri S. Mulekar, and James T. McClave, Brooks/Cole, 5th Edition (2010)	2010
4	An Introduction to probability and Statistics, Vijay K Rohatgi & A K Md.Ehsanes Saleh, Wiley, 2nd Edition (2008)	2008
5	Statistical Methods, S P Gupta, Sultan Chand & Sons, 49th Edition (2019)	2019
6	Fundamentals of Mathematical Statistics, S C Gupta & V K Kapoor, Sultan Chand & Sons, 12th Edition (2020)	2020

B. Tech . Computer Science and Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
CO102: Discrete Structures	**3**	**1**	**0**	**NIL**

Course Objective: The objective of the course is to **l**earn the Concepts of Formal Logics and appraise the need for properties of relations, functions, and sequences to complete operations on discrete structures such as sets, functions, relations, and sequences and mathematical proofs using counter-examples, direct proofs, proof by contrapositive, proof by contradiction, case analysis, and mathematical induction. This course shall also illustrate the use of Lattices and Boolean Algebra and demonstrate the use of Graph Theory and counting techniques and combinatorics to determine the discrete Probability.

CO No.	Course Outcomes (CO)
1	Apply the properties of relations, functions, and sequences to complete operations on discrete structures such as sets, functions, relations, and sequences.
2	Verify the correctness of an argument using propositional logic, predicate logic, and truth tables.
3	Construct mathematical proofs using counter-examples, direct proofs, proof by contrapositive, proof by contradiction, case analysis, and mathematical induction
4	Apply counting techniques and combinatorics to determine discrete probability.
5	Model relationships using graphs and trees.

S. No	Contents	Contact Hours

UNIT 1	**Formal Logic:** Statement, Symbolic Representation and Tautologies, Quantifiers, Predicator and validity, Normal form, Prepositional Logic, Predicate Logic, Logic Programming and Proof of correctors	**3**
UNIT 2	**Proof, Relation and Analysis of Algorithm:** Technique for theorem proving: Direct Proof, Proof by Contra position, proof by exhausting cases and proof by contradiction, Principle of mathematical induction, principle of complete induction, recursive definition, solution methods for linear, first-order recurrence relations with constant coefficients, analysis of algorithms involving recurrence rotations-recursive selection sort, binary search, quick sort, solution method for a divide-and-conquer recurrence relation.	**7**
UNIT 3	**Sets and Combinations:** Sets, Subsets, power sets, binary and unary operations on a set, set operations/set identities, fundamental counting principles, principle of inclusion, exclusion and pigeonhole, permutation and combination, Pascal's triangles, binomial theorem, representation of discrete structures.	**8**
UNIT 4	**Relation/function and matrices:** Rotations, properties of binary rotations, operation on binary rotation, closures, partial ordering, equivalence relation, properties of function, composition of function, inverse, binary and n-ary operations, characteristics of permutation function, composition of cycles, Boolean matrices, Boolean matrices multiplication.	**8**
UNIT 5	**Lattices & Boolean Algebra:** Lattices: definition, sublattices, direct product, homomorphism Boolean algebra: Definition, properties, isomorphic structures (in particular, structures with binary operations) subs algebra, direct product and homomorphism, Boolean function, Boolean expression, representation & minimization of Boolean function.	**8**
UNIT 6	**Graph Theory:** Terminology, isomorphic graphs, Euler's formula (Proof) four color problem and the chromatic number of a graph, five color theorem. Trees terminology, directed graphs, Computer representation of graphs, Warshall's algorithms, Decision Trees, Euler path & Hamiltonian circuits, Shortest path & minimal spanning trees, Depth-first and breadth first searches, analysis of search algorithm, trees associated with DFS & BFS Connected components, in order, preorder & post order tree traversal algorithms.	**8**
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Kenneth H. Rosen, "Discrete Mathematics and Its Applications", TMH (ISBN: 9780070681880),1999	1999

2	C.L. Liu, “Elements of Discrete Mathematics”, TMH (ISBN: 9780007043477),2000	2000
3	Kolman, Busby & Ross, “Discrete Mathematical Structures”, PHI (ISBN- 978-0132297516),1996	1996
4	NarsinghDeo, “Graph Theory With Application to Engineering and Computer Science”, PHI (ISBN: 9788120301450),2004	2004
5	J. P. Trembly& P. Manohar, “Discrete Mathematical Structures with Applications to Computer Science”, McGraw Hill (ISBN: 0070651426),1997	1997

B. Tech. Electrical Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
EE102:Data Structures and Algorithms	3	0	2	**NIL**

Course Objective: The students will be able to differentiate kinds of data structures with their respective applications and understand applications of data structures. They will be able to apply data structures in various programs and learn to use data structures for different programs.

S. NO	Course Outcomes (CO)
CO1	Access different kinds of data structures with their respective applications.
CO2	Devise data structures for programs
CO3	Differentiate between static and dynamic data structures
CO4	Develop programs using different types of data structures

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Introduction to Algorithmic, Complexity- Time-Space Trade off. Introduction to abstract data types, design, implementation and applications. Introduction to List data structure. Arrays and Strings: Representation of Arrays in Memory: one dimensional, Two dimensional and Multidimensional, Accessing of elements of array, performing operations like Insertion, Deletion and Searching. Sorting elements of arrays. Strings and String Operations	**10**

UNIT 2	Stacks and Queues: Introduction to data structures like Stacks and Queues. Operations on Stacks and Queues, Array representation of Stacks, Applications of Stacks: recursion, Polish expression and their compilation conversion of infix expression to prefix and postfix expression, Operations of Queues, Representations of Queues Applications of Queues, Priority queues. Linked Lists: Singly linked lists, Representation of linked list, Operations of Linked list such as Traversing, Insertion and Deletion, Searching, Applications of Linked List. Concepts of Circular linked list and Doubly linked list and their Applications. Stacks and Queues as linked list.	**10**
UNIT 3	Trees: Basic Terminology, Binary Trees and their representation, binary search trees, various operations on Binary search trees like traversing, searching, Insertion and Deletion, Applications of Binary search Trees, Complete Binary trees, Extended binary trees. General trees, AVL trees, Threaded trees, B- trees. Searching and Sorting: Linear Search, Binary search, Interpolation Search, Insertion Sort, Quick sort, Merge sort, Heap sort, sorting on different keys, External sorting.	**12**
UNIT 4	Graphs: Terminology and Representations, Graphs & Multi-graphs, Directed Graphs, Representation of graphs and their Transversal, Spanning trees, shortest path and Transitive Closure, Activity Networks, Topological Sort and Critical Paths. File Structure: File Organization, Indexing & Hashing, Hash Functions, Collision Resolution Techniques.	**10**
	TOTAL	

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Introduction to Algorithms, by T. H. cormen, C.E. Leiserson, R. L. Rivest, C. Stein, Fourth Edition, 2022.	2022
2	Data Structures, Tannenbaum, PHI, 2007(Fifth Impression)	2007
3	An introduction to data structures and application by Jean Paul Tremblay & Pal G. Sorenson (McGraw Hill), Second Edition, 2017.	2017
4	Data structure and program design in C, R.L. Kruse, B.P. Leary, C.L. Tondo, PHI, 2009(Fourth Impression)	2009
5	Seymour Lipschutz Saucham's series , data Structures, Mc, Graw Hill Publication, 2018	2018

B. Tech. Electronics & Communication Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
	L	**T**	**P**	
EC102:Data Structures and Algorithms	**3**	**0**	**2**	**NIL**

Course Objective: The students will be able to differentiate kinds of data structures with their respective applications and understand applications of data structures. They will be able to apply data structures in various programs and learn to use data structures for different programs.

S. NO	Course Outcomes (CO)
CO1	Access different kinds of data structures with their respective applications.
CO2	Devise data structures for programs
CO3	Differentiate between static and dynamic data structures
CO4	Develop programs using different types of data structures

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Introduction to Algorithmic, Complexity- Time-Space Trade off. Introduction to abstract data types, design, implementation and applications. Introduction to List data structure. Arrays and Strings: Representation of Arrays in Memory: one dimensional, Two dimensional and Multidimensional, Accessing of elements of array, performing operations like Insertion, Deletion and Searching. Sorting elements of arrays. Strings and String Operations	**10**
UNIT 2	Stacks and Queues: Introduction to data structures like Stacks and Queues. Operations on Stacks and Queues, Array representation of Stacks, Applications of Stacks: recursion, Polish expression and their compilation conversion of infix expression to prefix and postfix expression, Operations of Queues, Representations of Queues Applications of Queues, Priority queues. Linked Lists: Singly linked lists, Representation of linked list, Operations of Linked list such as Traversing, Insertion and Deletion, Searching, Applications of Linked List. Concepts of Circular linked list and Doubly linked list and their Applications. Stacks and Queues as linked list.	**10**

UNIT 3	Trees: Basic Terminology, Binary Trees and their representation, binary search trees, various operations on Binary search trees like traversing, searching, Insertion and Deletion, Applications of Binary search Trees, Complete Binary trees, Extended binary trees. General trees, AVL trees, Threaded trees, B- trees. Searching and Sorting: Linear Search, Binary search, Interpolation Search, Insertion Sort, Quick sort, Merge sort, Heap sort, sorting on different keys, External sorting.	**12**
UNIT 4	Graphs: Terminology and Representations, Graphs & Multi-graphs, Directed Graphs, Representation of graphs and their Transversal, Spanning trees, shortest path and Transitive Closure, Activity Networks, Topological Sort and Critical Paths. File Structure: File Organization, Indexing & Hashing, Hash Functions, Collision Resolution Techniques.	**10**
	TOTAL	

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Introduction to Algorithms, by T. H. cormen, C.E. Leiserson, R. L. Rivest, C. Stein, Fourth Edition, 2022.	2022
2	Data Structures, Tannenbaum, PHI, 2007(Fifth Impression)	2007
3	An introduction to data structures and application by Jean Paul Tremblay & Pal G. Sorenson (McGraw Hill), Second Edition, 2017.	2017
4	Data structure and program design in C, R.L. Kruse, B.P. Leary, C.L. Tondo, PHI, 2009(Fourth Impression)	2009
5	Seymour Lipschutz Saucham's series , data Structures, Mc, Graw Hill Publication, 2018	2018

B. Tech. Environmental Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
EN102: Environmental Awareness	3	1	0	**NIL**

Course Objective: This course aims at providing fundamentals of principles of environmental protection and an introduction to the environmental related treaties, Conventions and Protocols. This will enhance students' awareness towards global and Indian Environmental Legislations.

S. NO	Course Outcomes (CO)
CO1	Explain National and International Legislations for Environmental Protection.
CO2	Apply environmental legislations in case studies.
CO3	Analyse basic components and principles of environmental legislations.
CO4	Evaluate effectiveness of national and international environmental legislations.

S. NO	Contents	Contact Hours
UNIT 1	Global Environmental Treaties, Conventions and Protocols: Convention on International Trade in Endangered Species of wild fauna and flora (CITES), 1973, Montreal Protocol on Substances that deplete the Ozone Layer (to the Vienna Convention for the Protection of the Ozone Layer), 1987, Basel Convention on Transboundary Movement of Hazardous Wastes, 1989, UN Framework Convention on Climate Change (UNFCCC), 1992, Convention on Biological Diversity, 1992, UN Convention on Desertification, 1994, International Tropical Timber Agreement and The International Tropical Timber Organisation (ITTO), 1983 (introduction only).	9
UNIT 2	Indian Constitutional Perspective: Environment Protection under Constitutional Framework of India, Fundamental Rights – Article 14 (Right to equality, non-arbitrary and non-discriminatory treatment), Article 19(1)(g) (Freedom to carry on trade or business), Article 21 (Right to life, livelihood and wholesome environment) and Article 32 (Right to Constitutional remedies), Directive Principles of State Policy – Article 47, 48-A, Fundamental Duty – Article 51-A(g) (introduction only).	9
UNIT 3	Environmental Justice: Article 226 (Powers of High Courts), Public Interest Litigation – Nature – Non-Adversarial, Collaborative, Co-operative and Investigative, Locus Standi – Pro Bono Publico, Representative Standing, Citizens' Standing (introduction only). Principles of Environmental Protection - Development v. Environment; Sustainable Development, Inter-generational and Intra-generational Equity, Precautionary Principle, Polluter Pays Principle, Public Trust Doctrine, Perspectives on ISO 14000, ISO 22000, Industry 4.0, Industry 5.0.	8

UNIT 4	Legal and Regulatory Framework for Environmental Protection in India: Environmental (Protection) Act 1986, Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981, The Wildlife (Protection) Act, 1972, The Indian Forest Act, 1927, The Forest (Conservation) Act 1980, Hazardous Wastes (Management and Handling) Rules, 1989, The Biological Diversity Act, 2002, Energy and Mining Laws, EIA Notification 2006 (introduction only).	7
UNIT 5	Administrative Framework for Environmental Management in India: MoEFCC, Central Pollution Control Board, SPCBs/SPCCs, National Biodiversity Authority, National Tiger Conservation Authority, Animal Welfare Board of India, Forest Survey of India, Central Zoo Authority of India, The National Green Tribunal Act, 2010, The Public Liability Insurance Act, 1991, The National Environmental Tribunal Act, 1995, The National Environment Appellate Authority Act, 1997, Factories Act, 1948 and its Amendment in 1987 (introduction only).	7
	TOTAL	**40**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
	Prescribed Legislations	
1	The Water (Prevention and Control of Pollution) Act, 1974	**1974**
2	The Air (Prevention and Control of Pollution) Act, 1981	**1981**
3	The Environment (Protection) Act, 1986	**1986**
4	The Public Liability Insurance Act, 1991	**1991**
5	The National Green Tribunal Act, 2010	**2010**
6	The Biological Diversity Act, 2002	**2002**
7	The Wildlife (Protection) Act, 1972	**1972**
8	The Forest (Conservation) Act, 1980	**1980**
9	The Indian Forest Act, 1927	**1927**
10	The Scheduled Tribes & Other Traditional Dwellers (Recognition of Forest Rights) Act	2006
	Policies and reports	
1	The National Environment Policy, 2006	**2006**
2	The National Forest Policy, 1988	**1988**
3	The National Water Policy, 2012	**2012**
4	The Wildlife Conservation Strategy, 2002	**2002**
5	The World Commission on Environment and Development, Our Common Future, 1987	**1987**
6	IPCC Fifth Assessment Report (AR5). Synthesis Report: Climate Change 2014.	**2014**
	Prescribed Books	
1	Philippe Sands and Jacqueline Peel, Principles of International Environmental Law (4th ed.).	**2018**

2	Shibani Ghosh ed., Indian Environmental Law: Key Concepts and Principles.	**2019**
3	Geetanjoy Sahu, Environmental Jurisprudence and the Supreme Court: Litigation, Interpretation, Implementation	**2014**
4	Shyam Diwan and Armin Rosencranz, Environmental Law and Policy in India– Cases, Materials and Statutes (2nd ed.)	**2001**
5	P. Leelakrishnan, Environmental Law Case Book (2nd ed.)	**2010**
6	Gurdip Singh, Environmental Law in India (2nd ed.)	**2016**
7	P. Leelakrishnan, Environmental Law in India (5th ed.)	**2019**
8	Stuart Bell & Donald Mc Gillivray, Environmental Law (7th ed.)	**2008**

B. Tech. Engineering Physics

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
EP102: Computational Methods	3	1	0	**NIL**

Course Objective: This course is designed for the second semester (first year) students of the B. Tech. (Engineering Physics). This course is offer to familiarize the students with the numerical techniques to solve the problems related to science and engineering.

S. NO	Course Outcomes (CO)
CO1	Approximate the complex problem into well-known numerical form.
CO2	Analyse the variety of errors involved in the problem solving process in order to realize the accuracy of complex solutions.
CO3	Apply the problem solving skill to implement the various numerical algorithms for linear and non-linear equations, data prediction using interpolation and approximation.
CO4	Solve the complicated numerical differentiation, integration and differential equations using numerical methods related to multi-disciplinary complex problems.
CO5	Design and solve the minor project related activities using the knowledge gained in this course.

S. NO	Contents	Contact Hours
UNIT 1	Errors in numerical calculations: Introduction, Number and their accuracy, Errors and their analysis, Absolute, Relative, Percentage and Maximum probable error, Physical significance of errors, General error formula, Error in series approximation.	6

UNIT 2	Solution of numerical algebraic and transcendental equation: Roots of equations, Direct method and iteration method, Bisection method, Regula Falsi Method or Method of False position, Secant or Chord method, Newton-Raphson method, Roots of polynomial, solution of nonlinear simultaneous equations using Newton Raphson Method, Condition of Rate of convergence, Convergence of Bisection, Regula-Falsi, Secant and Newton Raphson Method	10
UNIT 3	Interpolation: Introduction, Finite differences, Difference Operators and relation between them, Detection of errors by use of difference tables, Differences of a polynomial, Interpolation with equally spaced data points: Newton's forward and backward formulae for interpolation, Central difference: Gauss forward, Gauss Backward, Stirling, Bessels, Everett's formula for interpolation, Interpolation with unequally data points: Lagrange's interpolation formula, Divided differences and their property, Newton Divided differences formula, Curve fitting: Introduction, Least square curve fitting procedures, fitting a straight line, nonlinear curve fitting, curve fitting by a sum of exponentials, Data fitting with cubic splines	12
UNIT 4	Numerical Differentiation and Integration: Numerical differentiation, formulae for derivatives: Derivative using Newton forward difference and backward formula, derivative using central difference formula, maximum and minimum values of a tabulated data, Numerical integration, Newton-cotes integration formulae, trapezoidal method, Simpson's 1/3-rule, Simpson's 3/8-rule, Boole's and Weddle's Rule, Error in quadrature formulae, Romberg integration, Euler-Maclaurin formula, Numerical double integration	8
UNIT 5	Numerical solution of ordinary differential equations: Introduction, solution by Taylor's series, Picard's method of successive approximation methods, Euler's method, modified Euler's method, Runge-Kutta method, predictor-corrector method, solution of second order and simultaneous differential equations	6
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Numerical Methods for Engineers; S. C. Chapra, R. P. Canale, McGraw-Hill International Editions.	1998
2	An Introduction to Computational Physics; T. Pang, Cambridge University Press.	2010

3	Numerical Methods for Engineers and Scientists; A. Gilat, John Wiley & Sons .	2008
4	Applied Numerical Analysis; Gerald, Wheatley, Pearson.	2003
5	Numerical methods for Scientific and Engineering Computation; J. Iyengar, Jain, New Age.	2009

B. Tech. Information Technology

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
IT102: Discrete Structures	**3**	**1**	**0**	**NIL**

Course Objective: The objective of the course is to **l**earn the Concepts of Formal Logics and appraise the need for properties of relations, functions, and sequences to complete operations on discrete structures such as sets, functions, relations, and sequences and mathematical proofs using counter-examples, direct proofs, proof by contrapositive, proof by contradiction, case analysis, and mathematical induction. This course shall also illustrate the use of Lattices and Boolean Algebra and demonstrate the use of Graph Theory and counting techniques and combinatorics to determine the discrete Probability.

S. NO	Course Outcomes (CO)
CO1	Apply the properties of relations, functions, and sequences to complete operations on discrete structures such as sets, functions, relations, and sequences.
CO2	Verify the correctness of an argument using propositional logic, predicate logic, and truth tables.
CO3	Construct mathematical proofs using counter-examples, direct proofs, proof by contrapositive, proof by contradiction, case analysis, and mathematical induction.
CO4	Apply counting techniques and combinatorics to determine discrete probability.
CO5	Model relationships using graphs and trees.

S. NO	Contents	Contact Hours

UNIT 1	Formal Logic: Statement, Symbolic Representation and Tautologies, Quantifiers, Predicator and validity, Normal form, Prepositional Logic, Predicate Logic, Logic Programming and Proof of correctors.	3
UNIT 2	Proof, Relation and Analysis of Algorithm: Technique for theorem proving: Direct Proof, Proof by Contra position, proof by exhausting cases and proof by contradiction, Principle of mathematical induction, principle of complete induction, recursive definition, solution methods for linear, first-order recurrence relations with constant coefficients, analysis of algorithms involving recurrence rotations-recursive selection sort, binary search, quick sort, solution method for a divide-and-conquer recurrence relation.	7
UNIT 3	Sets and Combinations: Sets, Subsets, power sets, binary and unary operations on a set, set operations/set identities, fundamental counting principles, principle of inclusion, exclusion and pigeonhole, permutation and combination, Pascal's triangles, binomial theorem, representation of discrete structures.	8
UNIT 4	Relation/function and matrices: Rotations, properties of binary rotations, operation on binary rotation, closures, partial ordering, equivalence relation, properties of function, composition of function, inverse, binary and n-ary operations, characteristics of permutation function, composition of cycles, Boolean matrices, Boolean matrices multiplication.	8
UNIT 5	Lattices & Boolean Algebra: Lattices: definition, sublattices, direct product, homomorphism Boolean algebra: Definition, properties, isomorphic structures (in particular, structures with binary operations) subs algebra, direct product and homomorphism, Boolean function, Boolean expression, representation & minimization of Boolean function.	8
UNIT 6	Graph Theory: Terminology, isomorphic graphs, Euler's formula (Proof) four color problem and the chromatic number of a graph, five color theorem. Trees terminology, directed graphs, Computer representation of graphs, Warshall's algorithms, Decision Trees, Euler path & Hamiltonian circuits, Shortest path & minimal spanning trees, Depth-first and breadth first searches, analysis of search algorithm, trees associated with DFS & BFS Connected components, in order, preorder & post order tree traversal algorithms.	8
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Discrete Mathematics and Its Applications; K. H. Rosen, TMH.	1999
2	Elements of Discrete Mathematics; C. L. Liu, TMH.	2000
3	Discrete Mathematical Structures; Kolman, Busby & Ross, PHI.	1996
4	Graph Theory With Application to Engineering and Computer Science; N. Deo, PHI.	2004
5	Discrete Mathematical Structures with Applications to Computer Science; J. P. Trembly, P. Manohar, McGraw Hill.	1997

B. Tech. Mechanical Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
ME102: Electronics & Communication Concept for Mechanical Engineers	**L**	**T**	**P**	**NIL**
	3	**0**	**2**	

Course Objective: To familiarize the students with the fundamentals of analog electronic devices and circuits, digital circuits and schemes for analog and digital communications.

S. NO	**Course Outcomes (CO)**
CO1	Explain the principles of operation of semiconductor devices such as diode, BJT, JFET and MOSFET.
CO2	Design and analysis of CE-amplifier using small signal hybrid-pi model.
CO3	Simplify logic expression using Boolean law, Skills to minimize logic expression using k-map and design of various combinational and sequential logic circuits.
CO4	Explain the concepts of various Analog modulation schemes.
CO5	Illustrate the concepts of various Digital modulation schemes.

S. NO	**Contents**	**Contact Hours**

UNIT 1	PN junction diode, V-I characteristics, Half wave and full wave rectifiers, Clipping and Clamping circuits, Zener diode as a voltage regulator.	6
UNIT 2	Bipolar Junction Transistor: Physical operation, CB, CC, CE Characteristics, operating point, load line, DC biasing circuit: Self Bias. Common emitter amplifier: Small signal model (Hybrid Pi-model), Current gain, voltage gain, input/output Impedance. Introduction to JFET and MOSFET: Structure and Characteristics.	12
UNIT 3	Digital circuits: Boolean algebra, Logic gates, K map up to 4 variables, Binary Adder and subtractor, MUX and DMUX, Flip flops: SR, JK, D, T.	10
UNIT 4	Basic Block Diagram of Analog Communication system, Concepts of Analog modulation Schemes: AM, FM, PM.	6
UNIT 5	Basic Block Diagram of Digital Communication system, Concepts of Sampling, Pulse code modulation, Concepts of Digital modulation Schemes: ASK, FSK, PSK.	8
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Electronic Devices and Circuit Theory; R. Boylestad, L. Nashelsky, Prentice Hall, 7th edition.	1998
2	Digital Design; M. M. Mano, Pearson Education, 4th edition.	2006
3	Modern Analog and Digital Communication; B. P. Lathi, Oxford, 3rd edition.	1998
4	Communication Systems; H. Simon, John Wiley & Sons, 4th edition.	2006

B. Tech. Mechanical Engineering Specialization in Automotive Engineering

Course code: Course Title	Course Structure			Pre-Requisite
AE102: Electronics and Communication concepts for Mechanical Engineers	L	T	P	NIL
	3	0	2	

Course Objective: To familiarize the students with the fundamentals of analog electronic devices and circuits, digital circuits, and schemes for analog and digital communications.

S. NO	Course Outcomes (CO)
CO1	Explain the principles of operation of semiconductor devices such as diode, BJT, JFET and MOSFET.
CO2	Design and analysis of CE-amplifier using small signal hybrid-pi model.
CO3	Simplify logic expression using Boolean law, Skills to minimize logic expression using k-map and design of various combinational and sequential logic circuits.
CO4	Explain the concepts of various Analog modulation schemes.
CO5	Illustrate the concepts of various Digital modulation schemes.

S. NO	Contents	Contact Hours
UNIT 1	PN junction diode, V-I characteristics, Half wave and full wave rectifiers, Clipping and Clamping circuits, Zener diode as a voltage regulator.	6
UNIT 2	Bipolar Junction Transistor: Physical operation, CB, CC, CE Characteristics, operating point, load line, DC biasing circuit: Self Bias. Common emitter amplifier: Small signal model (Hybrid Pi-model), Current gain, voltage gain, input/output Impedance. Introduction to JFET and MOSFET: Structure and Characteristics.	12
UNIT 3	Digital circuits: Boolean algebra, Logic gates, K map up to 4 variables, Binary Adder and subtractor, MUX and DMUX, Flip flops: SR, JK, D, T.	10
UNIT 4	Basic Block Diagram of Analog Communication system, Concepts of Analog modulation Schemes: AM, FM, PM.	6
UNIT 5	Basic Block Diagram of Digital Communication system, Concepts of Sampling, Pulse code modulation, Concepts of Digital modulation Schemes: ASK, FSK, PSK.	8
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Electronic Devices and Circuit Theory; R. Boylestad, L. Nashelsky, Prentice Hall, 7th edition.	1998
2	Digital Design; M. M. Mano, Pearson Education, 4th edition.	2006
3	Modern Analog and Digital Communication; B. P. Lathi, Oxford, 3rd edition.	1998
4	Communication Systems; H. Simon, John Wiley & Sons, 4th edition.	2006

B. Tech. Mathematics and Computing

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
MC102: Discrete Structures	**3**	**1**	**0**	**NIL**

Course Objective: The objective of the course is to **l**earn the Concepts of Formal Logics and appraise the need for properties of relations, functions, and sequences to complete operations on discrete structures such as sets, functions, relations, and sequences and mathematical proofs using counter-examples, direct proofs, proof by contrapositive, proof by contradiction, case analysis, and mathematical induction. This course shall also illustrate the use of Lattices and Boolean Algebra and demonstrate the use of Graph Theory and counting techniques and combinatorics to determine the discrete Probability.

S. NO	Course Outcomes (CO)
CO1	Apply the properties of relations, functions, and sequences to complete operations on discrete structures such as sets, functions, relations, and sequences.
CO2	Verify the correctness of an argument using propositional logic, predicate logic, and truth tables.
CO3	Construct mathematical proofs using counter-examples, direct proofs, proof by contrapositive, proof by contradiction, case analysis, and mathematical induction.
CO4	Apply counting techniques and combinatorics to determine discrete probability.
CO5	Model relationships using graphs and trees.

S. NO	Contents	Contact Hours

UNIT 1	Formal Logic: Statement, Symbolic Representation and Tautologies, Quantifiers, Predicator and validity, Normal form, Prepositional Logic, Predicate Logic, Logic Programming and Proof of correctors.	3
UNIT 2	Proof, Relation and Analysis of Algorithm: Technique for theorem proving: Direct Proof, Proof by Contra position, proof by exhausting cases and proof by contradiction, Principle of mathematical induction, principle of complete induction, recursive definition, solution methods for linear, first-order recurrence relations with constant coefficients, analysis of algorithms involving recurrence rotations-recursive selection sort, binary search, quick sort, solution method for a divide-and-conquer recurrence relation.	7
UNIT 3	Sets and Combinations: Sets, Subsets, power sets, binary and unary operations on a set, set operations/set identities, fundamental counting principles, principle of inclusion, exclusion and pigeonhole, permutation and combination, Pascal's triangles, binomial theorem, representation of discrete structures.	8
UNIT 4	Relation/function and matrices: Rotations, properties of binary rotations, operation on binary rotation, closures, partial ordering, equivalence relation, properties of function, composition of function, inverse, binary and n-ary operations, characteristics of permutation function, composition of cycles, Boolean matrices, Boolean matrices multiplication.	8
UNIT 5	Lattices & Boolean Algebra: Lattices: definition, sublattices, direct product, homomorphism Boolean algebra: Definition, properties, isomorphic structures (in particular, structures with binary operations) subs algebra, direct product and homomorphism, Boolean function, Boolean expression, representation & minimization of Boolean function.	8
UNIT 6	Graph Theory: Terminology, isomorphic graphs, Euler's formula (Proof) four color problem and the chromatic number of a graph, five color theorem. Trees terminology, directed graphs, Computer representation of graphs, Warshall's algorithms, Decision Trees, Euler path & Hamiltonian circuits, Shortest path & minimal spanning trees, Depth-first and breadth first searches, analysis of search algorithm, trees associated with DFS & BFS Connected components, in order, preorder & post order tree traversal algorithms.	8
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication /
1	Discrete Mathematics and Its Applications; K. H. Rosen, TMH.	1999
2	Elements of Discrete Mathematics; C. L. Liu, TMH.	2000
3	Discrete Mathematical Structures; Kolman, Busby & Ross, PHI.	1996

4	Graph Theory With Application to Engineering and Computer Science; N. Deo, PHI.	2004
5	Discrete Mathematical Structures with Applications to Computer Science; J. P. Trembly, P. Manohar, McGraw Hill.	1997

B. Tech. Production and Industrial Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
PE102: Electronics and Communication concepts for Mechanical Engineers	**3**	**0**	**2**	**NIL**

Course Objective: To familiarize the students with the fundamentals of analog electronic devices and circuits, digital circuits and schemes for analog and digital communications.

S. NO	Course Outcomes (CO)
CO1	Explain the principles of operation of semiconductor devices such as diode, BJT, JFET and MOSFET.
CO2	Design and analysis of CE-amplifier using small signal hybrid-pi model.
CO3	Simplify logic expression using Boolean law, Skills to minimize logic expression using k-map and design of various combinational and sequential logic circuits.
CO4	Explain the concepts of various Analog modulation schemes.
CO5	Illustrate the concepts of various Digital modulation schemes.

S. NO	Contents	Contact Hours
UNIT 1	PN junction diode, V-I characteristics, Half wave and full wave rectifiers, Clipping and Clamping circuits, Zener diode as a voltage regulator.	6
UNIT 2	Bipolar Junction Transistor: Physical operation, CB, CC, CE Characteristics, operating point, load line, DC biasing circuit: Self Bias. Common emitter amplifier: Small signal model (Hybrid Pi-model), Current gain, voltage gain, input/output Impedance. Introduction to JFET and MOSFET: Structure and Characteristics.	12
UNIT 3	Digital circuits: Boolean algebra, Logic gates, K map up to 4 variables, Binary Adder and subtractor, MUX and DMUX, Flip flops: SR, JK, D, T.	10
UNIT 4	Basic Block Diagram of Analog Communication system, Concepts of Analog modulation Schemes: AM, FM, PM.	6

UNIT 5	Basic Block Diagram of Digital Communication system, Concepts of Sampling, Pulse code modulation, Concepts of Digital modulation Schemes: ASK, FSK, PSK.	8
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Electronic Devices and Circuit Theory; R. Boylestad, L. Nashelsky, Prentice Hall, 7th edition.	1998
2	Digital Design; M. M. Mano, Pearson Education, 4th edition.	2006
3	Modern Analog and Digital Communication; B. P. Lathi, Oxford, 3rd edition.	1998
4	Communication Systems; H. Simon, John Wiley & Sons, 4th edition.	2006

B. Tech. Software Engineering

Course code: Course Title	**Course Structure**			**Pre-Requisite**
	L	**T**	**P**	
CS104:Fundamentals of Computers	**3**	**0**	**2**	**NIL**

Course Objective: Everyday, engineering students required to work with computer for problem solving in academia, research, and industry. Students will get knowledge about the evolution of computer, computer architecture, input devices, output devices, computer codes, computer software, operating system, computer arithmetic, and internet. Thus, students will be able to learn about the importance of data storage in the computer and computer security. With the help of this course, the student will be able to understand the functioning of computer units, and usage of computer to do everyday task.

S. NO	**Course Outcomes (CO)**
CO1	Describe the procedure of designing algorithm and drafting pseudocode for problem solving.
CO2	Describe the computer organization and architecture of central processing unit.
CO3	Describe the computer codes, computer arithmetic and number conversion system.
CO4	Describes the procedure of installing functionalities and installation of different operating system, software.
CO5	Describe the process of data storage and modelling using database management system.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Evolution of Computers, Generation of Computers, Classification of Computers, Computing Concepts, The Computer System, Applications of Computers. Computer Organization and Architecture: Central Processing Unit, Internal Communications, Machine Cycle, The Bus and Instruction Set.	8
UNIT 2	Memory and Storage Systems: Memory Representation, Random Access Memory, Read Only Memory, Storage System - Magnetic, Optical, Magneto, Solid State, Storage evaluation criteria. Input Devices. Output Devices	8
UNIT 3	Computer Codes: Decimal System, Binary System, Hexadecimal system, Octal System, 4-bit Binary Coded Decimal, 8-bit BCD System, 16-bit Unicode, Conversion of Numbers. Computer Arithmetic. Binary Systems, Boolean Algebra, and logic gates (AND, OR, NOR, and XOR), Simplification of Boolean functions, combinational logic, adders, subtractors, code conversions, synchronous and asynchronous sequential logic.	8
UNIT 4	Computer Software: Types of Computer Software, System Management Program, System Development Programs, Standard Application Programs. Operating System: History of Operating System, Functions of Operating System, Process Management, Memory Management, File Management, Device Management, Security Management, Types of Operating System.	8
UNIT 5	Database Management System: Database system, File System, Data Models, Data Independence, DBMS System Architecture, Components of DBMS, Relational Data Model, Relational Database Design, Data Storage, and Indexing.	10
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Fundamentals of Computer Science, Balaguruswamy, McGraw Hill Education (India) Private Ltd.	2009
2	Fundamentals of Computers, V. Rajaraman, PHI	2014

3	Handbook of Computer Fundamentals, Nasib Singh, Khanna Books Publishing Co. (P) Ltd.	2016
4	Computer Fundamentals, P.K. Sinha, BPB Publication.	2004
5	Introduction to Computer, Norton Peter, McGraw-Hill.	2021

Syllabi of Discipline Specific Core Courses (DCC)

B. Tech. Biotechnology				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
BT104: Introduction to Biotechnology	**L**	**T**	**P**	**NIL**
	3	**1**	**0**	

Course Objective: The course integrates the fundamental concepts of life and physical sciences together with the basic laboratory skills necessary in the biological sciences. It provides foundational concepts in a broad spectrum of disciplines such as biochemistry, genetic engineering, biophysics, microbiology, molecular and cell biology.

S. NO	Course Outcomes (CO)
CO1	Define global significance of biotechnology and examine the potential applications of Biotechnology in all sectors of life.
CO2	Compare and contrast prokaryotic and eukaryotic cellular architecture.
CO3	Comprehend the functioning of various biomolecules and enzymes and to compare and contrast various microorganisms.
CO4	Explain the underlying mechanism of gene expression and to explain, demonstrate, and appraise genetic engineering of organisms for human welfare and formulate new ideas.
CO5	Explain and translate separation, purification and identification techniques for biomolecules in research.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Definition, scope of Biotechnology; Applications of Biotechnology in Agriculture, Health, Food, Environment, and Industry.	8
UNIT 2	Cell Structure: Architecture of prokaryotic and eukaryotic cells; Functions of various cell organelles; Cell motility.	9
UNIT 3	Fundamentals of Biochemistry and Microbiology: Classification and functions of carbohydrates, proteins, lipids, nucleic acids; General characteristics, nomenclature, and classification of enzymes; Types and characteristics of microbes.	7

UNIT 4	Basic Concepts of Molecular Biology and Genetic Engineering: Structure of DNA and RNA; Gene organization; Central Dogma of Molecular Biology; Concept of recombinant DNA technology.	10
UNIT 5	Basics of Biophysical Methods: Electrophoresis, Centrifugation, Chromatography - Principle, procedure, and applications.	8
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Lehninger's Principle of Biochemistry; W. H. Freeman, Nelson and Cox. Publisher.	2017
2	Cell and Molecular Biology; Jacobs, CBS.	2016
3	Cell and Molecular Biology; P. Khanna, IK Intl.	2008
4	Molecular Cell Biology; Lodish, W. H. Freeman.	2016
5	Biochemistry; Voet and Voet, Wiley.	2010
6	Microbiology; Pelczar et al., Tata McGraw Hill.	2001
7	Microbiology; Tortora et al., Pearson Education.	2016
8	Molecular Biology of the Gene; Watson et al, Pearson.	2014
9	Gene Cloning & DNA Analysis: An Introduction; TA Brown, Wiley-Blackwell.	2016
10	Genetic Engineering, Rastogi and Pathak, OUP.	2009
11	Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology; Hoffman and Clokie (ed.), CUP.	2018

B. Tech. Chemical Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
CH104: Introduction to Chemical Engineering	**L**	**T**	**P**	**NIL**
	3	**1**	**0**	

Course Objective: To acquaint students with the fundamentals of Chemical Engineering and to build their perspective in a wholesome manner.

S. NO	Course Outcomes (CO)
CO1	Correlate the day to day life with the principles of chemical engineering.
CO2	Describe the unit operations and other processes involved in chemical industries.
CO3	Identify the major chemical industries and their future prospects in Indian and worldwide scenarios.
CO4	Identify the role of chemical engineers in society and identify their right future.
CO5	Correlate the chemical engineering with sustainable development and renewable energy.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Chemical Engineering in day to day life with examples, history of chemical processes industries, origin and growth of chemical engineering in chemical process industries, scaling up chemical processes for industrial scale operations.	8
UNIT 2	Unit Operations and Unit Processes: Concepts of unit operations and unit processes, classification of unit operations (fluid mechanics, heat and mass transfer, mechanical operations), Example of two or three unit operations from each type, their brief introduction and application. Brief introduction of industrial scale reactors. Brief introduction of process control and automation.	10

UNIT 3	Introduction to Chemical Industries: Classification of Chemical Industries (Petrochemical, Commodity, Fertilizer and Pesticides, Cement, Paint and Pigment, Soap, Inorganic chemicals, Food and dairy, Textile, Pharmaceutical and cosmetic), their main products, raw materials and market demand prospects based on Indian and worldwide markets, Process flow sheeting and symbols, Example of process flow diagram of one or two chemical industries.	10
UNIT 4	Career Diversities in Chemical Engineering: Career Development leading to specialization, chemical engineering job titles/options, chemical and processes engineers, process design engineers, commissioning engineers, process control and automation engineers, process safety engineers, Chemical engineers in research & development/product development, pipeline engineers, production engineers, Jobs in waste management and environment sectors, chemical engineer's prospects in techno-commercial jobs profiles (marketing, management, project planning, finance, policy deciding related jobs).	6
UNIT 5	Chemical Engineering and Environment: Development of new energy efficient and environmental friendly unit operations with two or three examples. Shifting towards green biomass based raw materials from Petroleum based raw materials with one or two examples, importance of chemical engineering in renewable green energy production and energy storage with one or two examples.	8
	TOTAL	**42**

Tutorial/Project work: One project report on any chemical process industry based on Indian and worldwide scenario with presentation / A Plant/ Industry visit with tour report.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Introduction to Chemical Engineering; S. Pushpavanam, PHI Learning.	2012
2	Unit Operations in Chemical Engineering; J. W. L. McCabe, J. C. Smith, P. Harriot, McGraw Hill.	2017
3	Outlines of Chemical Technology; C. E. Dryden, M. G. Rao, Affiliated East West Press.	1997

4	Sherve's Chemical Process Industries; Austin, Mc-GrawHill.	2017

B. Tech. Civil Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
CE104: Mechanics of Solids	**L**	**T**	**P**	**NIL**
	3	**0**	**2**	

Course Objective: To understand the influence of forces/loads on various objects.

S. NO	**Course Outcomes (CO)**
CO1	Describe the stress and strain.
CO2	Describe the complex stress and strain with pressure vessels and failure theories.
CO3	Draw Shear Force and bending moment diagrams of beams.
CO4	Compute bending and shear stresses in beams.
CO5	Describe concept of torque and buckling of columns.

S. NO	**Contents**	**Contact Hours**
UNIT 1	Stress and Strain: Stress, normal and shearing stresses, stresses acting at a point, complementary shear stress, stress tensor, determining stresses on a plane from given stress tensor. Strains, normal and shearing strain, measurement of strains, strain rosettes, strains acting at a point, strain tensor, determining strains on a plain from given strain tensor, principal strains, Strain-displacement relationships, conditions of compatibility and Generalised Hook's law, Relation amongst elastic constants.	10
UNIT 2	Complex Stress and Strain: Determining principal stress and their planes, Mohr's circle of stress and strain. Thin and thick cylindrical shells subjected to internal pressure, Spherical Shells subjected to internal pressure and their designs. Failure theory of materials.	8

UNIT 3	Shear Force and Bending Moment Diagrams: Basic concepts, Types of supports, Shear Force, Bending moments, relationship between them and their diagrams, Inclined loading, Gradual, sudden and Impact loading, loading and Bending Moment diagrams from Shear Force diagrams, Problems related to cantilever, simply supported, overhanging, fixed and continuous beams.	8
UNIT 4	Bending and Shear Stresses in Beams: Moment of inertia of different sections, including unsymmetrical sections and built up sections, Theory of simple bending, design criterion and section modulus, beams of composite section i.e. Flitched beams, Strain Energy due to bending, Force on a partial area of a beam section and its moment about neutral axis. Distribution of shearing stresses over rectangular, solid circular, I- and other sections, Principal stresses and principal planes at a point in a beam section.	8
UNIT 5	Shaft and Columns: Torsion of Shafts: Introduction, Relation between Twisting moment i.e. Torsion and shearing stress, Torsion of shafts not circular in section, Design of shafts, combined Bending and Torsion, Principal stresses, shafts in series and parallel, Torsion Strain Energy, Problems, Springs. Columns and Struts: Elastic Stability, Euler's Theory, Equivalent length, Limitations of Euler's Formula, Eccentric Loading, Practical End conditions and Effective Length Factors, Built up Columns.	8
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Theory of Elasticity; S. P. Timoshenko, J. N. Goodier, Tata Mc Graw Hill.	2010
2	Mechanics of Materials, J. M. Gere, S. P. Timoshenko. CBS Publishers.	2004
3	Mechanics of Materials; R. C. Hibbeler, Pearson.	2007
4	Mechanics of Materials; B. C. Punmia, A. K. Jain, A. K. Jain, Laxmi Publications (P) Ltd.	2001

B. Tech . Computer Science and Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	**T**	**P**	
CS104:Data Structures				**NIL**

CS104:Data Structures	3	0	2	NIL

Course Objective: The objective of studying data structures is to understand and utilize efficient techniques for organizing and managing data in computer programs.

S. NO	Course Outcomes (CO)
CO1	Demonstrate an in-depth understanding the properties, functionalities, and trade-offs of essential data structures such as arrays, linked lists, stacks, queues, trees, and graphs.
CO2	Analyze and evaluate the time and space complexity of operations performed on data structures, such as insertion, deletion, searching, and traversal.
CO3	Identify and select appropriate data structures to efficiently solve real-world computational problems.
CO4	Combine multiple data structures and algorithms to devise comprehensive solutions.

S. NO	Contents	Contact Hours
UNIT 1	Introduction:Introduction to Algorithms, Complexity- Time-Space Trade off. Introduction to abstract data types, design, implementation and applications. Introduction to List data structure. Arrays and Strings: Representation of Arrays in Memory: One-dimensional, Two dimensional and Multidimensional, Accessing of elements of array, performing operations like Insertion, Deletion and Searching. Sorting elements of arrays. Strings and String Operations. Stacks and Queues: Introduction to data structures like Stacks and Queues. Operations on Stacks and Queues, Array representation of Stacks , Applications of Stacks : recursion, Polish expression and their compilation conversion of infix expression to prefix and postfix expression, Operations of Queues, Representations of Queues Applications of Queues, Priority queues.	10
UNIT 2	Linked Lists: Singly linked lists, Representation of linked list, Operations of Linked list such as Traversing, Insertion and Deletion, Searching, Applications of Linked List. Concepts of Circular linked list and Doubly linked list and their Applications. Stacks and Queues as linked list. Trees:Basic Terminology, Binary Trees and their representation, binary search trees, various operations on Binary search trees like traversing, searching, Insertion and Deletion, Applications of Binary Search Trees, Complete Binary trees, Extended binary trees. General trees, AVL trees, Threaded trees.	10

UNIT 3	Graphs: Terminology and Representations, Graphs & Multi-graphs, Directed Graphs, Representation of graphs and their Transversal, Spanning trees, shortest path, minimum spanning trees, Activity Networks, Topological Sort and Critical Paths.	**7**
UNIT 4	Searching and Sorting: Linear Search, Binary search, Interpolation Search, Insertion Sort, Quick sort, Merge sort, Heap sort, sorting on different keys, External sorting. Hashing: Hashing, Hash tables, Hash Functions, Collision Resolution Techniques.	**7**
UNIT 5	Heaps: Binary heap structure, min-heap, max-heap and operations on heaps, Heap sort, Priority queues. B Trees: structure of nodes, operations like insertion, deletion, B+ trees. Disjoint Sets: representations, union and find operations, collapsing find, weighted union concepts.	**8**
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Horowitz, Sahni, Freed, “Fundamentals of Data structures in C”, ORIENT BLACKSWAN PRIVATE LIMITED, 2nd Edition.	2008
2	Tannenbaum, “Data Structures”, PHI	2008
3	Jean Paul Tremblay & Pal G. Sorenson , An introduction to data structures and application McGraw Hill.	2017
4	Robert Lafore, Data Structures and Algorithms in Java, Second edition, SAMS	2003
5	Michael T. Goodrich , Roberto Tamassia, Michael H. Goldwasser, Data Structures and Algorithms in Python, WILEY	2013
6	R.L. Kruse, B.P. Leary, C.L. Tondo, “Data structure and program design in C”, PHI	2007

B. Tech. Electrical Engineering

Course code: Course Title	Course Structure			Pre-Requisite
EE104: Circuit and	**L**	**T**	**P**	**NIL**

Field Theory	**3**	**0**	**2**	**NIL**

Course Objective: The objective of the course is to familiarize students with concepts of electrical circuits, magnetic circuits and basics of Electromagnetic field theory.

S. NO	Course Outcomes (CO)
CO1	Classify different types of sources, properties of electrical elements, solve DC networks using various techniques and theorems.
CO2	Analyze performance of single-phase AC circuits with help of phasor diagrams, apply the knowledge to explain phenomenon of resonance in series and parallel circuit.
CO3	Analyze and evaluate power in a balanced three phase AC circuit.
CO4	Analyze Magnetic circuits.
CO5	Describe the fundamental principles and mathematical models governing the behavior of electrostatic field and magnetostatic fields.
CO6	Describe the concept of time-varying fields and related Maxwell's equations, Poynting Vector.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Role and importance of circuits in Engineering, concept of fields, charge, current, voltage, energy and their interrelationships. V- I characteristics of ideal voltage and ideal current sources, various types of controlled sources, passive circuit components, V-I characteristics, and ratings of different types of R, L, C elements.	6
UNIT 2	Electrical Networks: DC Series and parallel circuits, power and energy, Kirchhoff's Laws, delta-star transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem. Single Phase AC Circuits: Average and effective values of sinusoids, concept of phasor, phasor diagram, complex impedance, series and parallel circuits, power factor, complex power, real power, reactive power and apparent power, resonance in series and parallel circuits, Q-factor, bandwidth and their relationship, half power points	10

UNIT 3	Three-Phase AC Circuits: Three phase emf generation, delta and star connection, line and phase quantities, solution of three phase circuits: balanced supply and balanced load, phasor diagram, three phase power measurement by two wattmeter method.Three-Phase AC Circuits: Three phase emf generation, delta and star connection, line and phase quantities, solution of three phase circuits: balanced supply and balanced load, phasor diagram, three phase power measurement by two wattmeter method.	6
UNIT 4	Magnetic Circuits: Ampere's circuital law, B-H curve, concept of reluctance, flux and mmf, analogies between electrical and magnetic quantities, solution of magnetic circuits, hysteresis and eddy current losses, mutual inductance, and dot convention.	4
UNIT 5	Electrostatic Fields: Coulomb's law and field intensity. Electric fields due to point, line, surface and volume charge distributions. Electric flux density, Gauss's Law. Application of Gauss's law - Point, Infinite line and sheet of charge and uniformly charged sphere. Electric potential, Relationship between E and V - Maxwell's equation. Scalar potential. Electric Dipole and its Electric field intensity. Electric flux lines and its properties- flux lines due to point charge and dipole. Energy density in Electrostatic filed. Convection, Conduction currents and current densities. Polarization in Dielectric and its effect on flux density(D). Continuity equation of current and Relaxation time. Electrostatic Boundary conditions - Dielectric- Dielectric, Conductor-Dielectric, Conductor-Free Space. Poisson's and Laplace's equations. The method of images used for finding V, E, D and r due to charges in the presence of conductors. Magnetostatic Fields: Biot-Savart's law, Amperes circuit law, and its Application on Infinite Line current, Infinite Sheet of current, Infinitely long co-axial Transmission line. Magnetic flux density. Maxwell equation for static EM fields. Magnetic scalar and vector potentials. Forces due to magnetic fields: Force on a charged particle, current element and between two current elements. Magnetic Torque and Moment, Magnetic Dipole. Magnetization in materials- M vector, Classification of magnetic materials. Magnetic boundary conditions. Inductance for simple geometry.	10
UNIT 6	Time Dependent Fields: General introduction, Faraday's Law. Transformer and motional emf - stationary loop in time varying B field (Transformer emf), Moving loop in static B field (Motional emf). Moving loop in time varying fields, Displacement current. Maxwell's equation in final forms, Time varying Potentials. Time harmonic fields. Introduction of Electromagnetic wave propagation, waves in general, wave propagation in lossy dielectric. Plane waves in loss less Dielectric, Plane waves in free space, Plane waves in good conductors. Power and Poynting vector. Reflection of Plane wave at normal incidence. Reflection of Plane wave at Oblique incidence - Parallel Polarization and Perpendicular Polarization.	6
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Linear Circuit Analysis: Time, Domain, Phasor and Laplace Transform Approaches Raymond; A. D. Carlo, P. M. Lin, Oxford University Press, 2nd Edition.	2001
2	Basic Electrical Engineering,; A. E. Fitzgerald, D. Higginbotham, A. Grabel, Tata McGraw-Hill Publishing Company; 5th Edition.	2009
3	Introduction to Electrical Engineering; M. S. Sarma, Oxford University Press.	2001
4	Electrical and Electronic Technology; E. Hughes, Pearson Education, 10th Edition.	2010
5	Fundamentals of Electric Circuits; C. K. Alexander, M. N. O. Sadiku.	2022
6	Electrical Engineering Fundamentals; V. D. Toro, Pearson Education, 2nd Edition.	2015
7	Basic Electrical Engineering; C. L. Wadhwa, New Age International Pvt Ltd Publishers	2007
8	Elements of Electromagnetics; M. N. O. Sadiku, Oxford University Press.	2014
9	Engineering Electromagnetics; W. H. Hayt, Mc Graw-Hill Int. Edition, 8th Edition	2011

B. Tech. Electronics & Communication Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
EC104: Network Analysis & Synthesis	**L**	**T**	**P**	**NIL**
	3	**1**	**0**	

Course Objective: The objective of the course is to make the students proficient of analyzing any given electrical network and to learn how to synthesize an electrical network from a given immittance function.

S. NO	Course Outcomes (CO)
CO1	Describe basic concepts of circuit analysis.
CO2	Descibe various type of responses for different type of excitations for RC, RL and RLC circuits.
CO3	Apply of Laplace transform in circuit analysis.
CO4	Find two port network parameters and composite network parameters.
CO5	Synthesize one port passive network (LC, RC & RL).

S. NO	Contents	Contact Hours
UNIT 1	Basics of Network Theory: Star-Delta transformation, Introduction to Sinusoid and phasors, Phasor relationship for circuit elements Kirchoff's Voltage Law (KVL), Kirchoff's Current Law (KCL), Nodal Analysis, Mesh Analysis. Network Theorems for AC and DC Circuits: superposition, Thevenin and Norton's, maximum power transfer, Tellegen's theorem and its application	10
UNIT 2	Transient Analysis: Introduction to first order circuits, Natural and forced response analysis of RC and RL circuits, Introduction to second order circuits, Natural and forced response analysis of series and parallel RLC circuits, Transient analysis of general second order circuits.	8
UNIT 3	Circuit Analysis using Laplace Transform: Basics of Laplace Transform for circuit Analysis, Analysis of linear time invariant networks, s-domain representation of passive elements, transform methods in circuit analysis, Analysis of first order (RC, RL) and second order (series and parallel RLC) circuits using Laplace transform.	8
UNIT 4	Two-port network parameters: driving point and transfer functions, Impedance parameter, admittance parameter, Hybrid parameters, transmission parameter, Relationships between parameters, Analysis of interconnected networks using network parameters conversion.	8

UNIT 5	Elements of Realizability Theory: Causality and Stability, Concept of Hurwitz Polynomial, Positive real functions and its properties, Elementary synthesis procedure. Synthesis of one port networks with two kinds of elements: Synthesis of LC, RC, RL network function using Foster and Cauer forms. Introduction to passive filter: Realization of low pass filter, High pass filter, Band pass filter, Band Reject filter, All pass filter	8
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Network Analysis; M. E. Van Valkenburg, Third Edition; Prentice Hall.	2019
2	Fundamentals of Network Analysis & Synthesis; B. Peikari; Jaico Publishing house.	2006
3	Network Analysis & Synthesis; F. F. Kuo; Wiley India edition, 2nd edition.	2006
4	Engineering Circuit analysis by Hyat Jr. & Kemmerly, McGraw Hill.	2013

B. Tech. Environmental Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	**T**	**P**	
EN104: Basic Environmental	**3**	**1**	**0**	**NIL**

Course Objective: This course aims at providing fundamentals of environmental engineering and an introduction to the services in environmental engineering. This will enhance student's awareness towards water and wastewater engineering, air and noise pollution and solid waste management and emerging fields in Environmental Engineering.

S. NO	Course Outcomes (CO)
CO1	Explain fundamentals of Environmental Engineering.
CO2	Apply fundamentals of Environmental Engineering to various environmental issues.
CO3	Analyse environment and pollution in each segment of the environment.

CO4	Evaluate environmental services required for water supply and treatment and control of environmental pollution.
CO5	Design various units for treatment of water, wastewater and for control of air and noise pollution.

S. NO	Contents	Contact Hours
UNIT 1	Water Engineering: Water demand and its variations. Population Forecasting, Physical, Chemical and Biological Quality Parameters, Drinking Water Quality Standards, Surface, subsurface, selection and development of sources.	8
UNIT 2	Wastewater Engineering: Wastewater Sources, Flow Rates and variations in flow. Physical, Chemical and Microbiological characteristics of waste water. Effluent disposal and re-use, surface disposal, Disposal into rivers, self-purification, oxygen sag curve.	8
UNIT 3	Water Treatment: Coagulation, mixing, flocculation, Sedimentation, Filtration, gravity and pressure filters. Water softening. Aeration, Disinfection, chlorination. Wastewater Treatment: Physical Treatment, screening, activated sludge, trickling filter, septic tanks, anaerobic sludge digestion, stabilization ponds and aerated lagoons.	8
UNIT 4	Solid Waste Management: Sources and composition. Principal industrial and hazardous solid waste, collection, characteristics and disposal.	8
UNIT 5	Air and Noise Pollution: Major air pollutants, sources and effects, measurement of air quality, criteria and standards, Atmospheric cleansing processes (Natural). Noise pollution standards effects and abatement.	8
	TOTAL	**40**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Howard S. Peavy, Donald R. Rowe, and George Tchobanoglous: Environmental Engineering, McGraw-Hill Series in Water Resources and Environmental Engineering, McGraw-Hill. ISBN: 0071002316, 9780071002318	1984
2	Santosh Kumar Garg, Environmental Engineering (Vol.-I): Water Supply Engineering, Khanna Publishers, ISBN: 9788174091208, 8174091203	1977

3	Santosh Kumar Garg, Environmental Engineering (Vol. II): Sewage Waste Disposal and Air Pollution Engineering ISBN 9788174092304, 8174092304	1979
4	Dr. B.C. Punmia, Ashok Kr. Jain, and Arun Kr. Jain, Environmental Engineering-I: Water Supply Engineering, Laxmi Publications, ISBN: 81-7008-092-4	2016
5	Dr. B.C. Punmia, Ashok Kr. Jain, Environmental Engineering-II: Wastewater Engineering (Including Air Pollution), Laxmi Publications, ISBN: 81-7008-091-6	2016
6	E. W. Steel, and T. J. McGhee, Water Supply and Sewerage, McGraw-Hill. ISBN:9780070609297, 0070609292	1979
7	G. S. Birdie, and J. S. Birdie, Water Supply and Sanitary Engineering (Including Environmental Engineering, Water and Air Pollution, Laws and Ecology), Dhanpat Rai Publisher, ISBN:9788187433798, 8187433795	2010
8	Metcalf & Eddy, George Tchobanoglous, Franklin Burton, H. David Stensel, Wastewater Engineering: Treatment and Reuse, McGraw Hill Education, ISBN 9780070495395.	2002

B. Tech. Engineering Physics

Course code: Course Title	**Course Structure**			**Pre-Requisite**
EP104: Fundamentals of Electrodynamics	**L**	**T**	**P**	**NIL**
	3	**0**	**2**	

Course Objective: This course aims to impart basic knowledge to students regarding electrostatic and magnetostatic fields and its applications. To understand the Maxwell's equations and its solution to the problem related to wave propagation and Transmission lines. To develop understanding of various types of antenna radiation mechanism.

S. NO	**Course Outcomes (CO)**
CO1	Describe basic concept of fields.
CO2	Describe physical interpretation and ability to solve the problem by applying fundamental laws.
CO3	Apply Maxwell's equations and its physical consequences for different parameters.

CO4	Describe the basic mathematical concepts related to Electromagnetic vector fields.
CO5	DescribeTransmission Lines and their application in EM wave propagation. Also, to analyse radiation patterns for various types of reflectors.

S. NO	Contents	Contact Hours
UNIT 1	Scalars and vectors, multiplication of vectors, the Gradient of a scalar field, the Divergence of a vector field, line integral and surface integral, curl of a vector, Stoke's theorem and Gauss divergence theorem. Gauss's law and Applications of Gauss's law.	10
UNIT 2	Gauss's law in Electrostatic and Magnetostatic, Current, current density, Equation of continuity, Ampere's circuital law, displacement current. Magnetization and Magnetic Flux.	5
UNIT 3	Maxwell's equations: Differential and Integral form, Physical Significance. Poynting Theorem, Physical significance of each term of Poynting Theorem and Poynting Vector.	8
UNIT 4	Propagation of plane electromagnetic waves in free space, Isotropic Dielectric (non-conducting) medium, and conducting medium. Wave equation derivation and its solution in terms of Electric & Magnetic field vectors, condition for Poor conductors and good conductors, skin depth or penetration depth.	9
UNIT 5	Introduction to Antenna and Transmission lines: Radiation intensity, Directive gain, Directivity, Power gain, and Beam Width. Transmission lines : transmission line équation in time and frequency domain.	10
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Introduction to Electrodynamics; D. J. Griffiths, Pearson Education, 4th Edition.	2017
2	Electromagnetic Waves and Radiating Systems; E. C. Jordan, K. G. Balmain, Pearson Education.	2015
3	Microwave Devices and Circuits; S. Y. Liao, Prentice-Hall of India, Pvt Ltd.	2003
4	Advanced Engineering and Electromagnetics; C. A. Balanis.	2012

5	Antennas and Wave Propagation, J. D. Kraus, R. J. Marhefka, A. S. Khan.	2017

B. Tech. Information Technology				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
IT104: Object Oriented Programming	**L**	**T**	**P**	**NIL**
	3	**0**	**2**	

Course Objective: The objective of the course is to understand the basics of classes and objects and provide knowledge of Object-Oriented programming features. This course also aims to understand the concept of operator overloading and inheritance and the concept of exception handling, Input-Output and File Operation.

S. NO	Course Outcomes (CO)
CO1	Differentiate between structured and object-oriented programming.
CO2	Apply the concepts of constructor, destructor, friend functions and classes and dynamic objects.
CO3	Investigate cases of operator overloading, inheritance and abstraction.
CO4	Implement generic programming with templates.
CO5	Investigate Byte code, casting and conversion and input-output.
CO6	Explain access specifiers, polymorphism and STL.

S. NO	Contents	Contact Hours
UNIT 1	Object oriented paradigm & C++ at a glance: Evolution of programming paradigm, structured versus object-oriented development, elements of object-oriented programming, Objects, classes, methods, popular OOP languages, software reuse. Classes and objects: Introduction, Class revisited, constant objects and constructor, static data members with constructors and destructors, constructor overloading, nested classes, objects as arguments, returning objects, friend functions and friend classes, constant parameters and member functions, static data and member functions.	9
UNIT 2	Dynamic objects: Introduction, pointers to objects, array of objects, pointers to object members, this pointer, self-referential classes. Operator overloading and Inheritance: overloading of new and delete operators, conversion between objects and basic types, conversion between objects of different classes, overloading with friend functions, abstract classes, inheritance types, virtual base classes, virtual functions, pointer to derived class objects, and base class objects, pure virtual functions, virtual destructors.	10

UNIT 3	Generic programming with templates: Introduction, function templates, overloaded function templates, class templates, inheritance of class template, class template containership, class template with overloaded operators.	6
UNIT 4	Introduction to byte code, security and portability, Data Types, variables, operators, arrays, type conversion and casting, type promotion, Control statements, standard input-output, Designing Classes, constructors, methods. Access specifiers: public, private, protected, inheritance, packages and interfaces, Math, String, Vectors, and Array List classes. Polymorphism: function and operator overloading, function overriding, abstract classes.	8
UNIT 5	Exception Handling: exception types, nested try-catch, throw, throws and finally, statements, Multithread Programming: thread creation, synchronization and priorities. Input-output and file operations: Java.io, stream classes, Byte streams, character streams, serialization.	9
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	The Complete Reference: Java 2; P. Naughton, H. Schildt, McGraw Hill publisher, 12 edition.	2021
2	An Introduction to OO programming with Java; C. T. Wu, TMH.	2009
3	Object oriented with C++; Balaguruswami, McGraw Hill publisher, 8th Edition.	2020
4	Object Oriented Programming; Budd, Addison Wesley.	1991
5	Mastering C++; K. R. Venugopal Rajkumar, TMH.	2017
6	Object oriented Programming in C++ and Java; D Samantha, PHI.	2006

B. Tech. Mechanical Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	**T**	**P**	
ME104:Thermal Engineering I	**3**	**0**	**2**	**NIL**

Course Objective:

S. NO	Course Outcomes (CO)
CO1	Describe the basic thermal engineering concepts, boilers, steam turbines and condensers.
CO2	Describe the various types of Steam nozzle with its efficiency and the condition of maximum discharge
CO3	Analyse the working of boilers, steam turbines and condensers
CO4	Evaluate the performance of Simple, Reheat, Regenerative Rankine Cycle for various operating conditions
CO5	Examine and investigate the working and performance of impulse and reaction steam turbines with its losses and governing; various types of Steam Condensers and Cooling Towers

S. NO	Contents	Contact Hours
UNIT 1	Fundamentals: Properties of pure substance in solid, liquid and vapour phases, PVT behavior of simple compressible system, T-S and H-S diagram, steam tables, determination of quality of steam, throttling calorimeter, combined separating & throttling calorimeter, Maxwell and other thermodynamics relations, mixture of non reactive ideal gases, real gases, compressibility chart, law of corresponding state, air water vapor mixture, calculation of properties of air water vapour mixture	7
UNIT 2	Rankine Cycle and Analysis: Rankine cycle and its representation on T-S and H-S diagrams; effect of low back pressure and high entry pressure and temperature and its limitations; necessity of reheating, ideal and actual regenerative feed water heating cycle and its limitations, typical feed water heating arrangements for various capacity power plants.	7
UNIT 3	Introduction to Boilers: Classification of boilers, boiler mountings and accessories; draft systems, circulation system; combustion and its calculations, and boiler performance.	7
UNIT 4	Steam Nozzles: Types of nozzles, flow of steam through nozzles; condition for maximum discharge through nozzle; nozzle efficiency, effect of friction and supersaturated flow through nozzle.	7
UNIT 5	Steam Turbines: Working principle and types of steam turbines; velocity diagrams for impulse and reaction turbines, compounding of impulse turbines; optimum velocity ratio and maximum efficiency, blade twisting, comparison of impulse and reaction turbines, condition line and reheat-factor, losses in steam turbines; governing of steam turbines	7

UNIT 6	Steam Condensers: Types and working of condensers, types and performance of cooling towers	7
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Basic and Applied Thermodynamics by P K Nag, Tata McGraw Hill Education private limited	2017
2	Thermodynamics by Yunus A Cengel and Michael A Boles, MacGraw Hill Education	2017
3	Thermal Engineering by Mahesh M Rathore, Tata McGraw Hill Education private limited	2010
4	Thermal Engineering by P L Ballney, Khanna Publishers	1966
5	Thermal Engineering by Sadhu Singh and Sukumar Pati, Pearson India Education Services Pvt. Ltd. , 2018.	2018
6	Applied Thermodynamics by Onkar Singh, Third edition, 2009, New Age Publications	2009

B. Tech. Mechanical Engineering Specialization in Automotive

Course code: Course Title	**Course Structure**			**Pre-Requisite**
AE104: Engineering Mechanics	**L**	**T**	**P**	**NIL**
	3	**0**	**2**	

Course Objective: The course aims to give students practice in applying their knowledge of mathematics, science, and engineering in the vast area of “rigid body Mechanics” and make the students able to analyse the problems of truss and frictions. This course also provide the student with skills to analyse kinematics of particles and rigid bodies.

S. NO	**Course Outcomes (CO)**
CO1	Describe the basic laws and principles of mechanics
CO2	Analyze and solve simple problems in mechanics
CO3	Draw free body diagrams and determine the resultant of forces and/or moments
CO4	Determine the centroid and second moment of area of sections. Learn to draw shear force and bending moment diagrams

CO5	Solve problems in kinematic and dynamic systems

S. NO	Contents	Contact Hours
UNIT 1	Statics: Introduction, Important Vector quantities of Mechanics, Equivalent System of Forces. Moment of a force: Varignon's Theorem. Couple, Equivalent Couples, Equilibrium of Rigid Bodies, Free Body Diagram, Conditions of Rigid Bodies. (Solution of the problems by Vector method also.)	**7**
UNIT 2	Center of Gravity and Moment of Inertia: First and second moment of area and mass, radius of gyration, parallel axis theorem, product of inertia, rotation of axes and principal M. I., Thin plates, M.I. by direct method (integration), composite bodies. Virtual work and Energy method: Virtual Displacement, principle of virtual work, mechanical efficiency, work of a force/couple (springs etc.), Potential Energy and equilibrium, stability.	**7**
UNIT 3	Truss: Types, Solution of Simple plane trusses by analytical and graphical methods.	**7**
UNIT 4	Friction: Laws of dry friction, Friction Cone, Angle of Repose, Engineering Applications of friction e.g. Wedge, Belt & Pulley and Screw Jack etc. Shear Forces and Bending Moments in Different Beams. Dynamics.	**7**
UNIT 5	Kinematics of Particles: Rectilinear motion, plane curvilinear motion - rectangular coordinates, normal and tangential component. Kinetics of Particles: Equation of motion, rectilinear motion and curvilinear motion, work energy equation, conservation of energy, impulse and momentum conservation of momentum, impact of bodies, co-efficient of restitution, loss of energy during impact. Euler equations of motion and its application.	**7**
UNIT 6	Kinematics of Rigid Bodies: Concept of rigid body, type of rigid body motion, absolute motion, introduction to relative velocity, relative acceleration (Corioli's component excluded) and instantaneous center of velocity, Velocity and acceleration polygons for four bar mechanism and single slider mechanism. Kinetics of Rigid Bodies: Equation of motion, translatory motion and fixed axis rotation, application of work energy principles to rigid bodies conservation of energy.	**7**
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**

1	Mechanics for Engineers: Statics and Dynamics; Beer and Johnston, TataMcGraw hill Publishing Company Limited.	2013
2	Engineering Mechanics: I. H. Shames, Statics and dynamics, 4th Ed, PHI, 2002. ISBN-13: 978-0132791588	2002
3	Engineering Mechanics; S. S. Bhavikatti, New Age International Publishers.	2012
4	Engineering Mechanics; J. L. Meriam, L. G. Kraige, Vol I – Statics, Vol II – Dynamics, John Wiley, 6th edition.	2012

B. Tech. Mathematics and Computing

Course code: Course Title	Course Structure			Pre-Requisite
MC102: Complex Analysis	**L**	**T**	**P**	**NIL**
	3	**1**	**0**	

Course Objective: To acquaint the students with the knowledge of complex variables, contour integration, conformal mappings.

S. NO	Course Outcomes (CO)
CO1	Explain techniques of complex analysis in a comprehensible manner.
CO2	Identify the concepts and applications of complex analysis in mathematical modelling, physics and many other areas of mathematics especially applied scientific computing.
CO3	Apply appropriate complex analysis techniques in solving science and engineering related problems arising in various fields such as mechanical, electrical, and aerospace.
CO4	Describe use of techniques of complex analysis in applied mathematics and real-life applications.

S. NO	Contents	Contact Hours
UNIT 1	Algebra of complex numbers, the complex plane, polynomials, power series, radius of convergence, transcendental functions, Riemann Sphere, Stereographic Projection.	8

UNIT 2	Analytic functions, Cauchy-Riemann equations, Harmonic functions, Construction of analytic functions.	8
UNIT 3	Linear and bilinear Transformation, cross ratio and conformal mappings.	8
UNIT 4	Line integral in the Complex Plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of Analytic functions, Morera's theorem, Cauchy's estimate, Liouville's theorem, Fundamental theorem of Algebra.	9
UNIT 5	Taylor Series and Laurent Series, Singularities, types of singularities, zeros and poles, Residues, Residue theorem and its applications to evaluate improper real integrals.	9
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Functions of One Complex Variable; J. B. Conway, Springer	2012
2	Complex Analysis; J. Bak, D. J. Newman.	2017
3	Churchill and Brown, Complex Analysis with applications, Dennis G. Zill & Shanahan, Jones & Bartlett (student edition) 2nd Edition.	2009
4	Complex Variable; Schaum Series.	2009
5	Complex Analysis; A. Bourchtein, L. Bourchtein, Springer, 1st edition.	2021

B. Tech. Production and Industrial Engineering

Course code: Course Title	Course Structure			Pre-Requisite
PE104:Engineering	**L**	**T**	**P**	

Materials and Metallurgy	**3**	**0**	**2**	**NIL**

Course Objective: This course helps to understand how and why the properties of materials are controlled by structure and bonding at the atomic-scale, and by features at the microstructural and macroscopic levels and the design, selection and processing of materials for a wide range of applications in engineering and elsewhere. Also, help in understanding how and why the structure and composition of a material may be controlled by processing.

S. NO	Course Outcomes (CO)
CO1	Interprets the changes in Mechanical properties of a Crystal structure with increased defects in the crystal structure
CO2	Correlates between the Type of Corrosion with the material composition and Operating conditions.
CO3	Relate between the Carbon content, Cooling rate, and Mechanical properties.
CO4	Correlates the type of fracture obtainable based on the type of loading and the material used.
CO5	Categorises different Composite materials used in manufacturing Industry based on the matrix and the reinforcement.
CO6	Chooses type of Powder Metallurgy Technique to be adopted for selected components to be manufactured in the industry.

S. NO	Contents	Contact Hours
UNIT 1	Structure of metal: Crystal structure, miller indices for cubic and HCP crystals. Crystal imperfections and their effect on Mechanical properties of the material. Plastic deformation of single and Poly crystalline materials.	7
UNIT 2	Materials: Plain Carbon steels, effect of alloying elements, properties and uses, tool steels, stainless, wear resisting steels. Composition, properties, and use of non-ferrous alloys e.g. Aluminum, Copper and Zinc alloys. Corrosion: Types of corrosion, Galvanic cell, rusting of Iron, Methods of protection from corrosion.	7
UNIT 3	Solidification: Phases in metal system, lever rule, solidification of metal and alloys, solid solution, eutectic, eutectoid and inter-metallic compounds, Iron carbon equilibrium diagram, TTT-diagram. Heat Treatment: Heat treatment of Ferrous and Nonferrous materials, case hardening. Strengthening mechanisms.	7

UNIT 4	Fracture: Types of Fracture of metals and alloys, brittle and ductile, fracture, fatigue failure, effect of alloying elements, design consideration. Creep: Basic consideration in the selection of material for high and low temperature service, Creep curve, effect of material variables on creep properties, brittle failure at low temperature.	7
UNIT 5	Composite materials: Classification of the Composite material based on the reinforcement, characteristics, application of composite materials in industry.	7
UNIT 6	Powder Metallurgy: Principles, techniques, application, and advantages. Surface treatment.	7
	TOTAL	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Materials science and engineering: An introduction, William D. Callister, Jr,6e, John Wiley & Sons, Inc, ISBN-13: 978-0470556733	2010
2	Material Science &Engineering, V. Raghavan; 5e; Prentice Hall India learning Pvt. Ltd., ISBN: 978-81-203-2455-8	2004
3	Material Science &Engineering, William F. Smith, Javed Hashemi, Ravi Prakash, 5e, McGraw Hill Edn(India) Pvt. Limited; ISBN: 978-1-25-906275-9	2017
4	Materials & Processes in Manufacture, Degarmo E. Paul et.al, Prentice Hall India, New Delhi, ISBN-13-978-81-265-1336-9.3	1997
5	Engineering Metallurgy Part 1, Raymond A Higgim, Prentice Hall India, New Delhi, ISBN-13: 978-0340046401	1965
6	Principles of Engineering Metallurgy, L. Krishna Reddy, New Age Publication, New Delhi, ISBN: 978-81-224-2202-3	2008
7	Engineering Materials & Properties, Budinski et al, Prentice Hall India, New Delhi, ISBN-13: 978-0137128426	2009
8	Material science, metallurgy and Engineering materials, 1e, Dr. K. M. Gupta, Umesh Publications, ISBN:978-933-80117-69-0	2010
9	Mechanical Metallurgy, George E. Deiter, 1e, McGraw Hill Book company, ISBN: 0-07-100406-8	2017
10	Elements of Material science and Engineering, Lawrence H. Van.Vlack, 6e, Pearson education Inc, ISBN: 978-81-317-0600-8	2002

B. Tech. Software Engineering

Course code: Course Title	Course Structure			Pre-Requisite
SE104: Fundamentals of Software Engineering	**L**	**T**	**P**	**NIL**
	3	**1**	**0**	

Course Objective: Students of Software Engineering are to work with software in the company. Students should get familiar with the basic knowledge of software engineering for developing a product. This course will provide students a sufficient knowledge of software development models, categories of software requirements, criterion for designing an efficient software. Thus, this course will enable students to develop a software according to user requirements using appropriate software development process.

S. NO	Course Outcomes (CO)
CO1	Describe the phases of software development life cycle for designing an efficient software.
CO2	Identification of user requirements using various requirements elicitation techniques.
CO3	Describe the procedure of designing software requirement specification for designing software as per user requirements.
CO4	Describe the basics of software design using various techniques.

S. NO	Contents	Contact Hours
UNIT 1	Introduction: Software, Program, Software Crisis and Solutions, Software Evolution, Software Development Paradigm, Need of Software Engineering, Software Processes, Software Characteristics, Attributes of Software Product, Software Myths, Software basic terminologies, Characteristics of good software.	10
UNIT 2	Software life cycle models: Build and Fix, Waterfall, Prototype, Iterative Enhancement, Rapid Application Development, Evolutionary, Prototyping, and Spiral Model.	12
UNIT 3	Software Requirements Analysis and Specifications: Requirement Engineering, Types of Requirements. Requirement Elicitation: Interview, Brainstorming, Quality Functional Deployment, Use Case Approach.	10
UNIT 4	Requirements Analysis: Problem Analysis, Data Flow Diagrams, Data Dictionaries, Entity-Relationship Diagram, Requirements Documentation, Requirements Validation, Software Requirement and Specifications, Requirements Management, Change Management Form, Structure of SRS, IEEE Std 830-1993, Software Prototyping.	12

UNIT 5	Software Design: Design framework, Conceptual and Technical Design, Trade-off between modularity and software cost, Cohesion and Coupling, Types of cohesion and coupling, strategy of design, Structure chart, IEEE standard 1016-1998 for Software Design Description.	12
	TOTAL	**56**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Software Engineering; K. K. Aggarwal, Y. Singh, New Age International Private Limited, 4th edition.	2017
2	Software Engineering – A practitioner's approach; R. S. Pressman, McGraw Hill Int. Ed, 6th edition.	2017
3	Software Engineering Concepts; R. Fairley, McGraw Hill Education.	2017
4	An Integrated Approach to Software Engineering; P. Jalote, Narosa.	2005
5	Software Engineering; I. Sommerville, Pearson Education, 10th edition.	2017

Syllabi of Skill Enhancement Courses (SEC)

B. Tech. Biotechnology				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
BT103: Applied Aquaculture	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to give first-hand training on various aspects of Aquaculture and enhance quality aquacrops production. The course also provides skilled manpower development employment.

S. No	Course Outcomes (CO)
CO1	Demosntrate knowledge of economically aquatic organisms.
CO2	Apply skills acquired for setting up an aquarium and cultivating ornamental fishes.
CO3	Describe the role of fishes in the environmental management.
CO4	Visualize technology-based aquaculture systems like recirculating aquaculture systems, aquaponics systems, and advances in seed production and feed production processes.

S. No	Contents
UNIT 1	Introduction to Aquaculture: Designing (layout) and drawing of a self-sustainable Aquaculture farm, Identification of cultivable finfishes and shellfishes and drawing of their pictures, Collection, and identification of various freshwater aquatic plants, Understanding of the role of different aquatic plants in aquaculture, Identification of harmful aquatic insects and their remedial measures, Identification of various phytoplankton and zooplankton.
UNIT 2	Recirculating Aquaculture System (RAS) and water Quality management: Designing of a Recirculating Aquaculture System (RAS) and understanding of functions of its various parts in the maintenance of water quality. Designing of an Aquaponics System and its role in the sustainable aquaculture development. Fish Breeding, Construction of a fish aquarium, Maintenance of one Aquarium with fish during the Course tenure, Value addition in aquacrops and their preservation. Study of major water quality parameters viz., temperature, pH, dissolved oxygen, free carbon dioxide, alkalinity, and ammonia in a fish culture pond.

UNIT 3	Live Feed Culture and Feed Formulation: Culture of live food organisms, Culture of any fish larvae and their feeding, Selection of non-conventional ingredients for the formulation of fish feed, the study of biochemical composition (protein, lipid, carbohydrates, ash) contents of the ingredients, Formulation of fish feed using locally available ingredients, feeding techniques: hand feeding, bag feeding, demand feeding etc.,
UNIT 4	Aquaculture Site Visit: Visits to the local Fish market to get exposure to the various fishes, visit to a fish farm, Exposure to advanced aquacultural systems, viz. Recirculating Aquaculture System, Aquaponics System, visit to Pearl culture facility, visit to a National Institute, Visit to a fish processing industry.
UNIT 5	Aquaculture in Practice: First hand working experience with fish (minimum 15 days) in a fish farm/institute/laboratory, Preparation of a project proposal in any area of aquaculture for financial support.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	AOAC, Association of Official Analytical Chemists. Official Methods of Analysis. Washington, DC: Association of Official Analytical Chemists Inc.	2000
2	APHA, American Public Health Association. Standard Methods for the Examination of Water and Waste Water. 22 nd ed. Washington DC: American Public Health Association, American Water Works Association, Water Environment Federation.	2012
3	Aquaculture: principles and practices; T.V. R. Pillay, Blackwell Publishing.	2005
4	Aquahouse. New Dimension of Sustainable Aquaculture; R. Chakrabarti, J. G. Sharma, Indian Council of Agricultural Research.	2008
5	Larval Fish Nutrition; G. J. Holt, Willey-Blackwell, UK.	2021

Course code: Course Title	Course Structure	Pre-Requisite

BT106: Development of Scientific Instrumentations and its applications	L	T	P	Basic Instrumentations
	1	0	2	

Course Objective: The objective of the course is to impart broad knowledge of commonly used instruments and their working principles, in development of new scientific instrumentation and medical devices.

S. No	Course Outcomes (CO)
CO1	Define various basic instruments and its type and applications in diagnostics and scientific investigation.
CO2	Apply electrophoresis techniques in separation and analysis of Macromolecules (DNA, RNA and proteins) and their fragments, based on their size and charge.
CO3	Illustrate chromatographic techniques and application of methods in biotechnology, pharmacy, diagnostics, therapy and scientific investigation.
CO4	Describe MEMS technology and application of biomedical device development.
CO5	Evalutae sensing technology and development of biosensors for medical diagnostics.

S. No	Contents
UNIT 1	Basic Instrumentation: Optical Techniques: Microscopy: Optical and Electron Microscopy, Fluorescence microscopy Hydrodynamic Techniques: Centrifugation: Viscosity and diffusion, Analytical and Preparative centrifuges Spectroscopic: UV and visible, spectrofluorimetry
UNIT 2	Advanced Instrumentation: Electrophoretic Techniques: Paper and gel electrophoresis, Immuno electrophoresis.
UNIT 3	Chromatographic Methods: Paper, TLC gas chromatography, gel filtration.
UNIT 4	Medical device design and development: Introduction to MEMS, Materials used-Technology involved in MEMS, MEMS Application in Medicine (BioMEMS): Special features / requirements for medical applications. Current scenario of MEMS for health care.

UNIT 5	Biosensors: Sensors and transducers; Chemistry of biomolecules and their immobilization for biosensors, Types of biosensors and their application -Environmental monitoring, process control, and clinical/biochemical analysis, Immunosensors.

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Principles and Techniques of Practical Biochemistry; K. Wilson, J. Walker, Cambridge University Press, 5th edition.	2000
2	Biophysical Chemistry: The conformation of Biological Macromolecules; C. R. Cantor, P. R. Schimmel, W. H. Freeman publisher.	1980
3	Introduction to Spectroscopy; D. L. Pavia, G. M. Lampman, G. S. Kriz, J. A. Vyvyan, Cengage learning.	2014
4	MEMS & Microsystem, Design and manufacture; T. R. Hsu , McGraw Hill.	2017
5	Biosensors: An Introductory Textbook; J. Narang, C. S. Pundir, Jenny Stanford Publishing; 1st edition.	2017

B. Tech. Chemical Engineering

Course code: Course Title	**Course Structure**			**Pre-Requisite**
CH103: Unit Processes in Organic Synthesis-I	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to inculcate skills in students related to the unit processes in organic synthesis.

S. No	**Course Outcomes (CO)**

CO1	Describe types of reactions (Addition, elimination, electrophilic and nucleophilic substitution, rearrangements), generation & structure of common reactive intermediates (carbocation, carbanion, and free radicals), electrophile and nucleophile.
CO2	Describe different types of unit processes involved in the production of industrially important products (halogenation, nitration, sulphonation, hydrogenation, and esterification).
CO3	Apply the unit processes for the manufacturing of industrial products.

S. No	Contents
UNIT 1	A brief introduction about: types of reactions (Addition, elimination, electrophilic and nucleophilic substitution, rearrangements), generation & structure of common reactive intermediates (carbocation, carbanion, and free radicals), electrophile and nucleophile, Different types of unit processes for the manufacturing of industrial products.
UNIT 2	Halogenation: Halogenating agents, mechanisms and kinetics of halogenation reactions, chlorination in the presence of a catalyst, photo halogenation. The industrial manufacturing process for at least one product.
UNIT 3	Nitration: Nitrating agents, aromatic nitration, kinetics and mechanism of aromatic nitration, Industrial processes for the manufacture of nitrobenzene.
UNIT 4	Sulphlonation: sulphonating agents and their principal applications, chemical and physical factors in sulphonation, kinetics and mechanism, desulphonation, workup procedures, Industrial process for the manufacture of benzene sulphonic acid by continuous partial-pressure distillation method.
UNIT 5	Hydrogenation: Catalytic hydrogenation reactions, hydrogenolysis reactions, general principles concerning hydrogenation catalysts, general classification of hydrogenation catalysts, hydrogenation equipment, Industrial processes for hydrogenation of oils and The industrial manufacturing process for at least one product like methanol.

UNIT 6	Esterification: of acids and their derivatives, transesterification, hydrolysis of esters, industrial application of hydrolysis of triglycerides, kinetics of ester hydrolysis.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Unit processes in Organic Synthesis; P. H. Groggins, McGraw Hill Education.	2001
2	Chemical Technology; A. F. Henglein, Pergamon Press.	1968
3	Organic Chemistry; Vol. 1, 6e, Finar, Pearson Education India.	2002

Course code: Course Title	Course Structure			Pre-Requisite
	L	**T**	**P**	
CH106: Unit Processes in Organic Synthesis-II	**1**	**0**	**2**	**NIL**

Course Objective: The objective of the course is to inculcate skills in students related to the unit processes in organic synthesis.

S. No	Course Outcomes (CO)
CO1	Describe different types of unit processes.
CO2	Illustrate application of unit processes for the manufacturing of chemicals.
CO3	Design chemical processes to synthesize industrially important products.

S. No	Contents
UNIT 1	Alkylation: alkylating agents, alkylation of alkanes and alkenes, aromatic ring, The industrial manufacturing process for at least one product.

UNIT 2	Oxidation: Types of oxidative reactions, oxidizing agents, oxidation of alcohols, aldehydes, and aniline, naphthalene.
UNIT 3	Reduction Methods of reduction: Iron and acid reduction of nitrobenzene – the chemical mechanism and chemical and physical factors.
UNIT 4	Reforming definition, process, and various reactions involved during reforming like cyclization, aromatization, dehydrogenation, Isomerization, alkylation for reforming, application of reforming in petroleum industry, production of hydrogen.
UNIT 5	Organometallic compounds, definition, difference from metallo-organic compounds, their role as reagent and as catalyst, applications in synthesis of industrially important products, organocatalysts.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Unit processes in Organic Synthesis; P. H. Groggins, McGraw Hill Education.	2001
2	Chemical Technology; A. F. Henglein, Pergamon Press.	1968
3	Organic Chemistry; Vol. 1, Finar, Pearson Education India.	2002

B. Tech. Civil Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	**T**	**P**	
CE103: Testing of Civil Engineering Materials	**1**	**0**	**2**	**NIL**

Course Objective: The objective of the course is to test on Construction materials like bricks, cement, aggregate, concrete, and steel.

S. No	Course Outcomes (CO)

CO1	Test the suitability of bricks for construction purpose.
CO2	Test the quality of cement.
CO3	Validate the suitability of aggregates for making concrete.
CO4	Test the quality of cement concrete and steel.

S. No	Contents
UNIT 1	Testing of bricks: Efflorescence of burnt clay building bricks, Compressive strength of brick, Water absorption test of brick.
UNIT 2	Testing of cement: Fineness, Standard consistency and setting times, Soundness, Compressive strength, Specific gravity.
UNIT 3	Testing of aggregates: Specific gravity and water absorption of coarse and fine aggregates, Particle size distribution and fineness modulus, Silt content of fine aggregate, Aggregate crushing value, Abrasion resistance using Los Angles machine, Flakiness and Elongation indices.
UNIT 4	Testing of cement, concrete, and steel: Consistency of freshly mixed concrete by slump test, Compressive strength of nominal Mix concrete, Flexural strength and splitting tensile strength of nominal mix concrete, Non-destructive testing of concrete, Tensile strength of steel, Hardness test of metal.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Material Testing Laboratory Manual; C. B. Kukreja, K. Kishore, R. Chawla, 3rd Edition,	2005
2	Building Materials; S. K. Duggal, New Age International Publishers.	2010
3	Civil Engineering Materials and their Testing; S. D. Hasan, Narosa Publishing House.	2011
4	Indian standard codes: Building material and steel structure IS codes and their description; Civil engineering Daily.	2018

Course code: Course Title	Course Structure	Pre-Requisite

CE106: Engineering Graphics and Building Drawing	L	T	P	NIL
	1	0	2	

Course Objective:

S. No	Course Outcomes (CO)
CO1	Visualize plan, elevation, and sectional view of an object.
CO2	Explain the spatial visual aspects of technical drawing.
CO3	Examine and visualize the objects with CAD for emerging digital era.
CO4	Visualize the drawing details of public buildings viz school, hostel, and hospital.

S. No	Contents
UNIT 1	Projections of points and lines. Projection of polygonal surface, Projection of solids like prisms, pyramids, cylinder, and cone Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections.
UNIT 2	Development of surfaces for various regular solids such as Prism, Cylinder, Pyramid and Cone. Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids.
UNIT 3	Introduction to AutoCAD: Basic commands for 2D drawing: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dimension style. Layout management, Plot setting, Create and manage dimension.
UNIT 4	Transformation of Projections: Conversion of Isometric Views to Orthographic Views and Vice-Versa in AutoCAD. Creation of engineering models and their presentation in standard 2D blueprint form.
UNIT 5	Conventional signs for civil engineering materials, Plan, elevation and section of public buildings such as school, hostel and hospital.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Fundamentals of Engg. Drg; W. J. Lucadder, Prentice Hall.	1976
2	Elementary Engineering Drawing; N. D. Bhatt, Charotar Publiction, 54th edition.	2023
3	Civil Engineering Drawing; Rangwala, Charotar Publishing House Pvt. Ltd, 3rd edition.	2017
4	Engineering Graphics with AUTOCAD; J. Bethune, D. Byrnes, Peachpit Press, 1st edition.	2022
5	Engineering Graphics with AutoCAD, D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, Prentice Hall India Learning Private Limited.	2010

B. Tech . Computer Science and Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
CS103: Web Designing	1	0	2	NIL

Course Objective:

S. No.	Course Outcomes (CO)
CO1	Define the principle of Web page design
CO2	Visualize the basic concept of HTML.
CO3	Recognize the elements of HTML.
CO4	Apply basics concept of CSS for styling the pages.
CO5	Develop the concept of web publishing.

S. No	Contents
UNIT 1	Introduction to Internet and HTML: WWW, Browser, URL, Web server, Web site, Domain Name, Basic principles involved in developing a web site, designing a web page, Page Layout, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags.

UNIT 2	Elements of HTML: Introduction, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls.
UNIT 3	Introduction to Cascading Style Sheets: Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling, Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, CSS Colour, Creating page Layout and Site Designs.
UNIT 4	Introduction to Web Publishing or Hosting: Creating the Web Site, Saving the site, working on the web site, creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	HTML 5 in simple steps, Kogent Learning Solutions Inc, Dreamtech Press	2010
2	Beginner's Guide to HTML, Michael Gabriel	-
3	Beginning HTML, XHTML, CSS, and JavaScript, John Duckett, Wiley India	2009
4	Beginning CSS: Cascading Style Sheets for Web Design, Ian Pouncey, Richard York, Wiley India	2011
5	HTML, XHTML, and CSS Bible, 5ed, Steven M. Schafer, Wiley India	2010

Course code: Course Title	Course Structure			Pre-Requisite
	L	T	P	
CS106: Basics of Machine Learning & Applications	1	0	2	**NIL**

Course Objective: The objective of the course is to develop the skill & knowledge of Machine Learning and understand the knowhow and can function either as an entrepreneur or can take up jobs in the data science.

S. No	Course Outcomes (CO)
CO1	Descibe the basic concepts of machine learning.
CO2	Preprocess the data.
CO3	Apply supervised algorithms on Real-world data.
CO4	Apply unsupervised algorithms on Real-world data.

S. No	Contents
UNIT 1	Introduction to Machine Learning: Machine Learning, Supervised vs Unsupervised Learning, Classification, Regression, Clustering.
UNIT 2	Data Pre-processing: Introduction, Working with CSV files, Handling missing values and outliers, Feature scaling and normalization, Encoding categorical variables, Splitting data into training and testing sets, Cross-validation techniques for model evaluation.
UNIT 3	SkLearn for Supervised Learning: Model Initialization, Model Training, Model prediction, Model evaluation, Model selection, Model Persistence, Feature selection, performance metrics, Ensemble methods, House-price prediction, Sentiment Analysis.
UNIT 4	SkLearn for Unupervised Learning: Clustering Algorithms, Anomaly Detection, Document Clustering.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Pattern Recognition and Machine Learning by Christopher M. Bishop	2006
2	The Elements of Statistical Learning: Data Mining, Inference, and Prediction by Trevor Hastie, Robert Tibshirani, and Jerome Friedman	2009
3	Machine Learning: A Probabilistic Perspective by Kevin P. Murphy	2012

4	Machine Learning by Andrew Ng	2018
5	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron	2019

B. Tech. Electrical Engineering

Course code: Course Title	**Course Structure**			**Pre-Requisite**
EE103: Electrical Workshop	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to familiarize students with concepts of electrical supply and wiring systems, LT cables, standard rules and regulations of electrical wiring, basic protective devices in supply systems, electrical tools and measuring equipment.

S. No	**Course Outcomes (CO)**
CO1	Develop skills for working with electric supply systems and hands on wiring with different electrical loads.
CO2	Develop skills for working with LT cables for underground cable laying and jointing.
CO3	Develop skills for working with overhead electrical supply systems.
CO4	Enumerate LT electricity rules and regulations / electrical and fire safety standards.
CO5	Examine working of electrical protective devices and switches in LT supply systems.
CO6	Explain process of operating and handling various electrical / mechanical tools and equipment for measuring electrical parameters.

S. No	**Contents**

UNIT 1	ELECTRICAL WIRING: AC Mains & switchboard, types of electrical loads and ratings, various electric lamps, Electric wiring systems, Parallel Wiring, Series Wiring, Series Wiring, Warehouse Wiring, live wire, neutral wire, earthing wire, and principle of earthing, shielded wires, residential, commercial, or industrial wiring. Specifications of the wire, current carrying capacity, Single solid strand and Multi strands wires, Standard wire gauge (SWG), ampacity, colour codes, difference between wires and cables. Electrical fixtures- Switches, CBs/MCBs, Fuses, sockets, Plugs, light fittings, electrical junction box, Distribution Boards, Meter Boards, Modular switch/plug/boards, mapping SLD, wiring circuit diagram, selection of wires for 1-phase 220V, 3phase 3-wire, 3phase 4 wire 430V topologies, single phase and three phase power measurement, Cost economics.
UNIT 2	ELECTRIC CABLES: Specifications of cables-single phase, three phase, current carrying capacity. Types of cables and ampacity –Single core, Multi core, Armoured cables, Coaxial cable, Fibre optic cable, underground cable laying, cable jointing.
UNIT 3	OVERHEAD SUPPLY SYSTEM: LT and HT power supply voltages and systems, types of conductors, power and current carrying limits, economical size of conductor, electrical panels and associated measuring/monitoring equipment, cost estimation.
UNIT 4	ELECTRICITY SAFETY STANDARDS/ RULES/ REGULATIONS: ISO standards, safety rules and regulations, standard symbols, Safety at the workplace, Fire safety.
UNIT 5	PROTECTION DEVICES AND SWITCHES: Introduction to safety devices – MCB, ELCB, RCCB, Contactors, AC DC electrical Fuses- applications, calculation of fuse ratings, Earthing-Pipe and Plate earthing, Toggle switch- Single Pole Double Throw, Double Pole Double Throw, Triple Pole Double Throw, Centre off, without centre off, Rotary and Rockery switches and applications.
UNIT 6	ELECTRICAL TOOLS and MEASURING EQUIPMENT: Cutter, strippers, testers, pliers, Analog/ digital- voltmeter, ammeter, energy meter, wattmeter, multi-meter, Meggar, DSO.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint

1	Electrical Wiring Estimating and Costing; S. L. Uppal, G. C. Garg, Khanna Publishers.	2020
2	A Course in Electrical Installation Estimating and Costing; J.B. Gupta.	2021
3	Guide to Electricity Laws; Sharma & Mago, Kamal Publishers.	2020
4	Electronic component and materials; S. M. Dhir, Tata McGraw Hills.	2018
5	IET Wiring Regulations: Electric Wiring for Domestic Installers; B. Scaddan, Routledge.	2019

Course code: Course Title	**Course Structure**			**Pre-Requisite**
EE106: PCB Fabrication and Testing	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is provide a succinct introduction on fabrication of PCB.

S. No	**Course Outcomes (CO)**
CO1	Describe the basics of PCB design.
CO2	Apply modern tools and demonstrate skills for designing PCB.
CO3	Evaluate and test a PCB.
CO4	Apply software and hardware for PCB Design.

S. No	**Contents**
UNIT 1	Introduction: Electronic components (Active and Passive), Need for PCB Design, PCB materials and documentation, Types of PCB's: Single layer, Multilayer.
UNIT 2	Introduction to PCB Design Tools: Altium, ORCAD, Proteus.

UNIT 3	PCB Design: IPC standards for schematic, Design Rules for analog circuits, digital circuits, and power electronics applications.
UNIT 4	PCB fabrication process: Printing the design, etching, drilling, interconnecting, soldering and de-soldering process, component mounting, PCB testing, photolithography process, screen printing, chemical etching.
UNIT 5	PCB Design Practices: Sample PCB Design, PCB designing of Electronics Projects, PCB designing of embedded systems, PCB designing of power supplies.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Printed Circuits Handbook; C. F. Coombs, H. Holden, McGraw-Hill Education, 6th edition.	2007
2	Complete PCB Design Using OrCAD Capture and PCB Editor; K. Mitzner, Newnes (an imprint of Butterworth-Heinemann Ltd).	2009
3	Signal Integrity Issues and Printed Circuit Board Design; D. Brooks, Prentice Hall.	2012
4	Fundamentals of Layout Design for Elctronics Circuits; J. Lienig, J. Schieble, Springer.	2020
5	Generic Standard for Printed Board Design, IPC -2221A; IPC-2221 Task Group (D-31b).	2022
6	Fundamentals of Microfabrication: : The Science of Miniaturization; M. J. Madou, CRC Press.	2002

B. Tech. Electronics & Communication Engineering

Course code: Course Title	Course Structure			Pre-Requisite
	L	**T**	**P**	
EC103: Electronics				**NIL**

Workshop I	1	0	2	NIL

Course Objective: The objective of the course is to impart practical knowledge to the students about electronic components, circuits and electronic instruments. This course on Electronic Workshop will enable students to get a good opportunity for beginning their professional career even at the end of first year.

S. No	Course Outcomes (CO)
CO1	Identify various electronic components and instruments.
CO2	Interpret the cause of error in an electronic board for possible fault in resistors and capacitors.
CO3	Differentiate between various ICs in terms of their identification numbers and functionalities.

S. No	Contents
UNIT 1	Basic components used in the Electronics circuits: Identification of various components being used in any electronic circuit such as resistor, capacitor, various diodes (p-n junction, Zenner, LED), transistors (BJT, MOSFET, FET), breadboard, potentiometer, Learn graphical symbols used to represent the various components, Computing the value of resistance, capacitance by its color code and value mentioned on the component.
UNIT 2	Instruments for measurement and analysis of Electronics circuits: Study the various control on the panel of a typical CRO, Multimeter, Take a picture of CRO, paste it in your file and write a brief description about CRO panel, Take a picture of Multimeter, paste it in your file and write a brief description about its feature, Testing of component such as resistance, capacitance and transistor as PNP or NPN, Gain value of transistor, connectivity of a wire using multimeter, Fault testing of the components such as resistor, capacitor and transistor, connectivity of wire using CRO.
UNIT 3	Instrument for generating the signals for the electronic circuits: Study the various control on the panel of a function generator and DC power supply, Take picture of function generator and DC power supply and paste it in your file and write a brief description about them, Using CRO and function generator perform jobs such as waveform analysis on CRO, Voltage measurement, frequency measurement, phase difference measurement etc. Using CRO and DC power supply perform jobs such as Voltage, current measurement, frequency measurement in a small circuit.

UNIT 4	Integrated circuit (IC) tester: Study the pin configuration of a given IC number, Study the function of IC tester, Testing of IC on the IC tester, Verify the truth table of various logic gates on the breadboard.
UNIT 5	Transformer and soldering iron: Study the transformer used in the electronic circuits, Learn the precautions while using a soldering iron, Learn the use of soldering iron.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Electronic Devices and Circuit Theory; R. L. Boylestad, L. Nashelsky, Prentice Hall.	2009
2	A Course In Electronic Measurements And Instrumentation; A. K. Sawhney, Dhanpat Rai & Co.	2015

Course code: Course Title	Course Structure			Pre-Requisite
EC106: Electronics Workshop II	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to impart practical knowledge to the students about electronic components, circuits, and electronic instruments. This course on Electronic Workshop will enable students to get a good opportunity for beginning their professional career even at the end of first year.

S. No	Course Outcomes (CO)
CO1	Design different types of printed circuit boards.
CO2	Demonstrate different components of a computer, various peripherals, and internal circuit component.
CO3	Design and modify a product by building an actual power supply.

S. No	Contents

UNIT 1	Printed circuit board: Learn to make a layout of electronic circuit using any PCB design software (OrCAD/TINA/ KiCAD/ DesignSpark PCB/ any other available software), Use of electronic components in the layout, Perform small jobs such as making a circuit on the PCB and learn soldering of components on PCB.
UNIT 2	Identification of various peripheral devices of computer: Identify various peripheral devices including a keyboard, mouse, printer, and flash drive of a computer.
UNIT 3	Disassembling of computer: Study of motherboard, Identification of various hardware peripherals like RAM, ROM and Processor, Study of various ports in a computer for interaction with computer.
UNIT 4	Product Development (Part 1): Study the basic circuit of variable DC power supply, Procure all the components required to build a DC supply like transformer, diodes, capacitor, resistance, potentiometer, on/off switch etc. for given specifications of DC power supply, Test each component.
UNIT 5	Product Development (Part 2): Design a PCB for variable DC power supply, Fabricate the variable DC power supply by assembling all the components on PCB and perform soldering, Test the fabricated variable DC Power supply.

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1		
2		
3		

B. Tech. Environmental Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
EN103: Water and Wastewater Analysis	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: This course will provide B. Tech. (Environmental Engineering) students with basic hands-on experience in various aspects of Water and Wastewater testing and analysis, allowing them to apply theoretical knowledge, develop practical skills, and gain a deeper understanding of real-world environmental challenges.

S. No	Course Outcomes (CO)
CO1	Demonstrate sampling and testing of water.
CO2	Test sampling and testing of water.
CO3	Demonstrate sampling and testing of waste water.
CO4	Test sampling and testing of waste water.
CO5	Analyze and categorize analyse the water and wastewater samples.

S. No	Contents
UNIT 1	Water Engineering Lab: Determination of physical and chemical characteristics of water.
UNIT 2	Water Engineering Lab: Determination of biological characteristics of water.
UNIT 3	Wastewater Engineering Lab: Determination of physical and chemical characteristics of wastewater.
UNIT 4	Wastewater Engineering Lab: Determination of biological characteristics of wastewater.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	IS 3025: Methods of Sampling and Test (Physical and Chemical) for Water and Wastewater, various parts.	1987
2	IS 1622 (1981): Methods of sampling and microbiological examination of water.	1981

Course code: Course Title	Course Structure			Pre-Requisite
EN106: Air Pollution and Waste Management	L	T	P	NIL
	1	0	2	

Course Objective: This course will provide B. Tech. (Environmental Engineering) students with basic hands-on experience in various aspects of Air and Noise Pollution, Solid Waste Management, and GIS and Remote Sensing allowing them to apply theoretical knowledge, develop practical skills, and gain a deeper understanding of real-world environmental challenges.

S. No	Course Outcomes (CO)
CO1	Demonstrate measurement of air quality parameters.
CO2	Demonstrate the operations for sampling and testing solid waste.
CO3	Demonstrate skills for GIS based assessments.

S. No	Contents
UNIT 1	Air Pollution Monitoring Lab.: Measurement of ambient air pollutants using appropriate monitoring equipment.
UNIT 2	Noise Pollution Monitoring Lab.: Sound Pressure Level Measurements.
UNIT 3	Solid Waste Management Lab.: Characterization of solid waste samples to determine composition and moisture content, calorific value.
UNIT 4	System Simulation & GIS Lab.: Basics of environmental modelling and systems thinking, Analysing, and visualizing environmental data using GIS softwares.

REFERENCES		
S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint

1	IS 5182: Methods for Measurement of Air Pollution, various parts.	1999
2	IS 9234: Methods of Sampling and Test for Solid Waste, various parts.	1979
3	Integrated Environmental Modelling; A. Ramaswami, J. B. Milford, M. J. Small, Wiley.	2005
4	Principles of Geographical Information Systems for Land Resource Assessment; P. A. Burrough, Oxford University Press.	1986
5	Geographical Information Systems: Principles, Techniques, Management and Applications; P. A. Longley, M. F. Goodchild, D. J. Maguire, D. W. Rhind, Wiley.	2005

B. Tech. Engineering Physics

Course code: Course Title	Course Structure			Pre-Requisite
	L	**T**	**P**	
EP103: Engineering Physics Workshop-I	**1**	**0**	**2**	**NIL**

Course Objective: The main objective of the course is to give hands-on experience of research through latest S&T equipment and facilities.

S. No	Course Outcomes (CO)
CO1	Explain the effect of excitation voltage and anode material for X-ray generation.
CO2	Experiment of structural characterization for determination of lattice parameters.
CO3	Evaluate the optical properties of materials.
CO4	Define the principle of image formation.
CO5	Describe the surface of the materials.

S. No	Contents
UNIT 1	X-RAY PRODUCTION: Electromagnetic radiation, continuous spectrum, characteristic spectrum, X-ray absorption (adsorption edge, excitation voltage, Auger effect etc.), X-ray filters.
UNIT 2	X-RAY DIFFRACTOMETER: Basics of crystallography and hands on experience of XRD instrument, Determination of lattice parameters, crystallite size and strain in nanomaterials.
UNIT 3	UV-VISIBLE SPECTROSCOPY: Basic principle of UV visible spectroscopy, Knowledge to record UV visible spectra of liquid, solid, and powder samples.
UNIT 4	INTRODUCTION TO MICROSCOPY: Basic principles of image formation, General concepts of microscopy: resolution. Magnification, depth of field, depth of focus etc.
UNIT 5	SCANNING ELECTRON MICROSCOPY: Working principle in scanning mode, Signal generation: Inelastic scattering (Secondary vs. backscattered electron, Auger electrons, characteristic X-ray emission etc.).

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Elements of X-ray diffraction; B. D. Cullity, Pearson Education.	2014
2	Scanning Electron Microscopy and X-Ray Microanalysis; I. J. Goldstein, D. E. Newbury, J. R. Michael, N. W. Ritchie, J. H. J. Scott, D. C. Joy, Springer, 4th edition.	2017
3	Light and Video Microscopy; R. O. Wayne, Elsevier.	2009
4	Fundamentals of molecular spectroscopy; C. N. Banwell, E. M. McCash, Mc-Graw Hill, Indian Edition.	1994

Course code: Course Title	Course Structure			Pre-Requisite
EP106: Engineering Physics Workshop-II	L	T	P	NIL
	1	0	2	

Course Objective: The main objective of the course is to provide opportunity for an individual to develop and strengthen the necessary skills for Glass Industry.

S. No	Course Outcomes (CO)
CO1	Describe fundamentals of glass sience.
CO2	Demonstrate synthesize of various glasses.
CO3	Categorize synthesized glasses.
CO4	Measure physical properties and other required parameters.
CO5	Validate the potentiality of the synthesized glass in Industry.

S. No	Contents
UNIT 1	Fundamentals of Glass Science & Technology.
UNIT 2	Synthesis and physical properties of Glass.
UNIT 3	Characterization of the synthesized Glass.
UNIT 4	GLASS-Handling, Measurements, Storage, Installation covering Tempered/Insulated/Laminated, Window Doors Sliders – uPVC, Window Doors Sliders – Aluminum.
UNIT 5	Applications of Glass in Industry.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Introduction to Glass Science and Technology; J. E. Shelby, Royal Society of Chemistry.	2020
2	Fundamentals of Inorganic Glasses; A. K. Varshneya, J. C. Mauro, Elsevier, 3rd edition.	2019

B. Tech. Information Technology

Course code: Course Title	Course Structure			Pre-Requisite
IT103: Fundamentals of Web Design	L	T	P	NIL
	1	0	2	

Course Objective: The objective of the course is to develop the skill & knowledge of Web page design and to knowhow the function either as an entrepreneur or can take up jobs in the multimedia and Web site development studio and other information technology sectors

S. No	Course Outcomes (CO)
CO1	Define the principle of Web page design.
CO2	Visualize the basic concept of HTML.
CO3	Recognize the elements of HTML.
CO4	Practice basics concept of CSS for styling the pages.
CO5	Develop the concept of web publishing.

S. No	Contents
UNIT 1	Introduction to Internet and HTML: WWW, Browser, URL, Web server, Web site, Domain Name, Basic principles involved in developing a web site, designing a web page, Page Layout, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks, HTML Tags.
UNIT 2	Elements of HTML: Introduction, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls.
UNIT 3	Introduction to Cascading Style Sheets: Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling, Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, CSS Colour, Creating page Layout and Site Designs.
UNIT 4	Introduction to Web Publishing or Hosting: Creating the Web Site, Saving the site, working on the web site, creating web site structure, Creating Titles for web pages, Themes-Publishing web sites.

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	HTML 5 in Simple Steps, Kogent Learning Solutions Inc, Dreamtech Press.	2010
2	Beginner's Guide to HTML, Michael Gabriel	
3	Beginning HTML, XHTML, CSS, and JavaScript; J. Duckett, Wiley India	2010
4	Beginning CSS: Cascading Style Sheets for Web Design, I. Pouncey, R. York, Wiley India	2011
5	HTML, XHTML, and CSS Bible, S. M. Schafer, Wiley.	2010

Course code: Course Title	**Course Structure**			**Pre-Requisite**
IT106: Open-Source Programming	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to learn the structure Python Programming Language and facilitate code reuse and manipulate strings. Also, to illustrate the process of structuring the data using lists, tuples, and dictionaries. The course will appraise the need for working on web scraping and extracting data from various file formats.

S. No	**Course Outcomes (CO)**
CO1	Demonstrate the concepts of control structures in Python.
CO2	Write Python programs using functions and strings.
CO3	Use methods to create and manipulate lists, tuples, and dictionaries.
CO4	Practice concepts of file handling and regex using packages.
CO5	Illustrate working of scraping websites with CSV.

CO6	Illustrate working of dealing with data in various types of files such as Excel, CS,PDF and JSON.

S. No	Contents
UNIT 1	Python Basics: Entering Expressions into the interactive shell, The integer, floating and string data types, string concatenation and replication, storing values in variables, your first Python program. Flow Control: Boolean Values, comparison operators, Boolean Operators, flow control statements, Importing Modules. Functions: definition statement with parameters, Range values, and return values, The none value, Keyword arguments with printf(), Local and Global scope, The global statement, and Exceptional Handling.
UNIT 2	LISTS: The list data type, working with lists, Augmented assignment operator, and List Methods. Dictionary: The Dictionary Data-Type, Using Dictionary to Model real-world Things like a tic-tact toe board, Nested Dictionary, and Lists. Manipulating Strings: Working with strings, Useful string Methods.
UNIT 3	Pattern Matching with Regular Expression: Finding Patterns of text without regular expression, Finding Patterns of text with regular expression, Greedy, and Non-Greedy Matching, the find all () method. Reading and Writing Files: File and File Paths, The os.path module, The file reading or writing process,. Web Scrapping: maplt.py with the browser model, Downloading files from the web with request module, parsing HTML with beautiful soap module.
UNIT 4	Working with Excel Spread Sheets: Installing the openpyxl module, Reading Excel documents, and writing Excel documents. Working with PDF and Word Documents: creating PDF, Extracting text from PDF, Reading and writing Word documents. Working with CSV files and JSON Data: The CSV module (Reading objects and Writing objects), JSON module (Reading JSON and Writing JSON).

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Automate the Boring Stuff with Python; Al Sweigart, William Pollock.	2020
2	Think Python: How to Think Like a Computer Scientist; A. B. Downey, Shroff/O'Reilly, 2nd edition.	2015

3	Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014.	2010

B. Tech. Mechanical Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
ME103: Workshop Practice	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to familiarize the students with manufacturing shops like Carpentry, Foundry, Welding, Machining, Fitting and Smithy.

S. No	**Course Outcomes (CO)**
CO1	Describe the fundamentals of workshop practices.
CO2	Choose appropriate manufacturing processes/tools/techniques for various jobs.
CO3	Practice various tools and machinery to make different jobs in various shops of the workshop.
CO4	Demonstrate various techniques to study about various hazards in workshop and standard safety procedures.
CO5	Eperiment workshop practices in fabrication and integration of various components for research/ project/ professional work.

S. No	**Contents**
UNIT 1	Carpentry: Study of Different Carpentry Tools and Pattern Making of a given job (pulley/screw jack body).
UNIT 2	Foundry: Study of Different Foundry Tools and Furnaces Making a green sand mould of a given pattern (pulley/screw jack body) and its casting.
UNIT 3	Welding: Arc welding of butt joint, T-joint and lap joint Study of other welding/ joining Techniques.

UNIT 4	Machining: Study of lathe, milling, drilling machine, shaper, planer and grinding machine. Demonstration of a job on lathe.
UNIT 5	Fitting: Study of various fitting hand tools, marking and measuring devices Preparation of a given job (box / funnel).
UNIT 6	Smithy: Study of different forming tools and power press Preparation of a given job (bolt / chisel).

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Manufacturing Processes for Engineering Materials, 6e; Serope Kalpakjian, Steven R. Schmid, Pearson Education.	2018
2	Basic Mechanical Engineering; P. Kumar, Pearson Education, 1/e.	2018
3	Elements Of Workshop Technology Vol-1; S. K. H. Choudhary, A. K. H. Choudhary, N. Roy, Media Promoters.	2008
4	Workshop Technology; W. Chapman, Routledge.	1972
5	Production Engineering, R. K. Jain, Khanna Publishers.	1976

Course code: Course Title	Course Structure			Pre-Requisite
ME106: Engineering Graphics	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to familiarize the students with drafting and engineering drawing practices.

S. No	Course Outcomes (CO)

CO1	Describe the principles of engineering graphics, rules of dimensioning, lettering, scales, types of projections, different planes used in projections.
CO2	Visualize projections of point's lies in different quadrants. Also, they will understand and obtain traces, true lengths shortest length and true angles with horizontal, vertical and auxiliary planes.
CO3	Visualize projections of plane surfaces of different shapes and traces of plane surfaces.
CO4	Define different types of solids and projections and sections of solids which axis parallel, perpendicular and inclined to horizontal planes.
CO5	Experiment application of development of surfaces, draw development of different types of surfaces, and isometric projections of solids with different shapes.

S. No	Contents
UNIT 1	General: Importance, Significance and scope of engineering drawing Lettering, Dimensioning, Scales, Sense of Proportioning, Different types of Projections, B.I.S. Specification, line symbols, rules of printing.
UNIT 2	Projections of Points and Lines: Introduction of planes of projection, Reference and auxiliary planes, projections of points and lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on auxiliary planes, shortest distance, intersecting and non-intersecting lines.
UNIT 3	Planes Other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points lines in the planes, conversion of oblique plane into auxiliary plane and solution of related problems.
UNIT 4	Projections of Plane Figures: Different cases of plane figure (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes). Obtaining true shape of the plane figure by projection.

UNIT 5	Projection of Solids: Simple cases when solid is placed in different positions, Axis, faces and lines lying in the faces of the solid making given angles.
UNIT 6	Isometric and Orthographic Views: First and Third angle of system of projection, sketching of Orthographic views from pictorial views and vice –versa, Sectional views.
UNIT 7	Principles of dimensioning.
UNIT 8	Development of lateral surfaces of simple solids.
UNIT 9	Introduction to available drafting softwares like AutoCAD.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Engineering Graphics; K. L. Narayana, P. Kannaiah, Tata McGraw Hill.	1988
2	Engineering Drawing Workbook; N. Kumar, S. C. Sharma, Dhanpat Rai Publishing Company.	2006
3	Engineering Graphics; A. M. Chandra, S. Chandra, CRC Press.	2003

B. Tech. Mechanical Engineering Specialization in Automotive Engineering

Course code: Course Title	Course Structure			Pre-Requisite
AE103: Workshop Practice	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to familiarize the students with manufacturing shops like Carpentry, Foundry, Welding, Machining, Fitting and Smithy.

S. No	Course Outcomes (CO)
CO1	Describe the fundamentals of workshop practices.
CO2	Choose appropriate manufacturing processes/tools/techniques for various jobs.
CO3	Practice various tools and machinery to make different jobs in various shops of the workshop.
CO4	Demonstrate various techniques to study about various hazards in workshop and standard safety procedures.
CO5	Eperiment workshop practices in fabrication and integration of various components for research/ project/ professional work.

S. No	Contents
UNIT 1	Carpentry: Study of Different Carpentry Tools and Pattern Making of a given job (pulley/screw jack body).
UNIT 2	Foundry: Study of Different Foundry Tools and Furnaces Making a green sand mould of a given pattern (pulley/screw jack body) and its casting.
UNIT 3	Welding: Arc welding of butt joint, T-joint and lap joint Study of other welding/ joining Techniques.
UNIT 4	Machining: Study of lathe, milling, drilling machine, shaper, planer and grinding machine. Demonstration of a job on lathe.
UNIT 5	Fitting: Study of various fitting hand tools, marking and measuring devices Preparation of a given job (box / funnel).

UNIT 6	Smithy: Study of different forming tools and power press Preparation of a given job (bolt / chisel).

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Manufacturing Processes for Engineering Materials, 6e; Serope Kalpakjian, Steven R. Schmid, Pearson Education.	2018
2	Basic Mechanical Engineering; P. Kumar, Pearson Education, 1/e.	2018
3	Elements Of Workshop Technology Vol-1; S. K. H. Choudhary, A. K. H. Choudhary, N. Roy, Media Promoters.	2008
4	Workshop Technology; W. Chapman, Routledge.	1972
5	Production Engineering, R. K. Jain, Khanna Publishers.	1976

Course code: Course Title	**Course Structure**			**Pre-Requisite**
AE106: Engineering Graphics	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to familiarize the students with drafting and engineering drawing practices.

S. No	**Course Outcomes (CO)**
CO1	Describe the principles of engineering graphics, rules of dimensioning, lettering, scales, types of projections, different planes used in projections.

CO2	Visualize projections of point's lies in different quadrants. Also, they will understand and obtain traces, true lengths shortest length and true angles with horizontal, vertical and auxiliary planes.
CO3	Visualize projections of plane surfaces of different shapes and traces of plane surfaces.
CO4	Define different types of solids and projections and sections of solids which axis parallel, perpendicular and inclined to horizontal planes.
CO5	Experiment application of development of surfaces, draw development of different types of surfaces, and isometric projections of solids with different shapes.

S. No	Contents
UNIT 1	General: Importance, Significance and scope of engineering drawing Lettering, Dimensioning, Scales, Sense of Proportioning, Different types of Projections, B.I.S. Specification, line symbols, rules of printing.
UNIT 2	Projections of Points and Lines: Introduction of planes of projection, Reference and auxiliary planes, projections of points and lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on auxiliary planes, shortest distance, intersecting and non-intersecting lines.
UNIT 3	Planes Other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points lines in the planes, conversion of oblique plane into auxiliary plane and solution of related problems.
UNIT 4	Projections of Plane Figures: Different cases of plane figure (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes). Obtaining true shape of the plane figure by projection.
UNIT 5	Projection of Solids: Simple cases when solid is placed in different positions, Axis, faces and lines lying in the faces of the solid making given angles.

UNIT 6	Isometric and Orthographic Views: First and Third angle of system of projection, sketching of Orthographic views from pictorial views and vice –versa, Sectional views.
UNIT 7	Principles of dimensioning.
UNIT 8	Development of lateral surfaces of simple solids.
UNIT 9	Introduction to available drafting softwares like AutoCAD.

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Engineering Graphics; K. L. Narayana, P. Kannaiah, Tata McGraw Hill.	1988
2	Engineering Drawing Workbook; N. Kumar, S. C. Sharma, Dhanpat Rai Publishing Company.	2006
3	Engineering Graphics; A. M. Chandra, S. Chandra, CRC Press.	2003

B. Tech. Mathematics and Computing

Course code: Course Title	**Course Structure**			**Pre-Requisite**
MC103: Python Programming	**L**	**T**	**P**	**Basic Computer Knowledge**
	0	**0**	**4**	

Course Objective: The objective of the course is to introduce fundamentals of programming using Python and understand the concepts of program.

S. No.	**Course Outcomes (CO)**
CO1	Describe the basic concepts like operators, functions, arguments, and iterations in Python.

CO2	Describe the concepts of strings, lists, tuples and dictionaries in Python.
CO3	Design Python programs with error handling techniques.
CO4	Explain the concepts of File Handling and object oriented programming in Python.

S. No.	Contents
UNIT 1	Introduction to Python: Arithmetic Operators, Variables, Expressions and Statements in Python, Function Calls, Parameters and Arguments, Infinite Recursion and Stack Diagrams, Logical Operators, Conditional and Alternative Execution, Iterations in Python.
UNIT 2	Strings and Dictionaries in Python: Immutable Strings, String Methods and Comparison, Mutable Lists, List Operations and Methods, Concept of Dictionary and Looping, Reverse Lookup, Immutable Tuples, Tuples as Return Values, Concepts of Namespaces and scope.
UNIT 3	Error handling and Files in Python: Error handling using try and except, Create your own exceptions, Filenames and Paths, Persistence, Reading and Writing, Catching Exceptions, Attributes, Mutable Objects, Classes and Functions, Pure Functions, Modifiers, Classes and Methods, Inheritance.

List of Experiments	
S.No.	**Title**
1	WAP that creates variables of numeric data types and perform arithmetic operations on them in Python.
2	WAP to declare variables of string datatype and perform different operations on them.
3	WAP to create, insert and delete Lists in Python.
4	WAP to create, insert and delete Dictionaries in Python.
5	WAP to create, insert and delete Sets and Tuples in Python.
6	WAP to print Fibonacci series using for loop in Python.
7	Create a function search list which takes a list of values as arguments and search a particular number in the list.

8	WAP for division of two numbers where denominator is 0. This will throw an exception. Now handle the exception using try and except.
9	WAP in Python that can create your own exceptions.
10	WAP to explain file handling in Python.
11	WAP to demonstrate objects and classes in Python.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Intro to Python for Computer Science and Data Science; P. Deitel, H. Deitel, Pearson Education, 1st edition.	2022
2	Python Crash Course A Hands-On, Project-Based Introduction to Programming; E. Matthes, No Starch Press, 3rd edition.	2023
3	Python: The Complete Reference; Martin C. Brown, McGraw Hill Education, 4th edition.	2018

Course code: Course Title	Course Structure			Pre-Requisite
MC106: MATLAB Programming	**L**	**T**	**P**	**NIL**
	0	**0**	**4**	

Course Objective: The objective of the course is to introduce fundamentals of MATLAB programming and perform mathematical operations in MATLAB.

S. No	Course Outcomes (CO)
CO1	Explain the basics and built in functions of MATLAB.
CO2	Describe mathematical operations on arrays in MATLAB.

CO3	Explain the working of relational / logical operators, conditional statements and loops in MATLAB.
CO4	Analyze different types of two-dimensional plots in MATLAB.
CO5	Solve Polynomial and Algebraic Equations in MATLAB.

S. No	Contents
UNIT 1	Introduction to MATLAB: Starting MATLAB, Working in the Command Window, Arithmetic Operations with Scalars, Elementary Math Built-in Functions, Defining Scalar Variables, Commands for Managing Variables.
UNIT 2	Arrays: One-Dimensional and Two-Dimensional Arrays, Array Addressing, Adding and Deleting Elements, Built-in Functions for Handling Arrays, Strings, Mathematical Operations with Arrays: Addition, Subtraction, Multiplication, and Division, Generation of Random Numbers.
UNIT 3	Relational and Logical Operators, Conditional Statements, Switch Case, Loops, Break and Continue commands. 2-D Plots: The plot command, fplot command, plotting multiple graphs in same plot, histograms.
UNIT 4	Polynomials and Symbolic Math: Polynomials, Curve Fitting, Solving Algebraic Equations, Differentiation, Integration.

List of Experiments	
S.No.	**Title**
1	WAP for basic arithmetic operations with scalars in MATLAB.
2	WAP to demonstrate mathematical built-in functions in MATLAB.
3	WAP to create 1-D and 2-D arrays in MATLAB. Further, add and delete elements in the arrays.
4	WAP to perform mathematical operations (addition, subtraction, array multiplication, array division) on arrays in MATLAB.
5	WAP to demonstrate conditional statements and switch case in MATLAB.
6	WAP to demonstrate loops in MATLAB.

7	WAP to construct plots using the plot/fplot command in MATLAB.
8	WAP to construct histograms in MATLAB.
9	WAP to solve polynomials and algebraic equations in MATLAB.
10	WAP to explain file handling in Python.
11	WAP to demonstrate differentiation and integration in MATLAB.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	MATLAB: A Practical Introduction to Programming and Problem Solving; D. Attaway, Butterworth-Heinemann, 6th edition.	2022
2	Beginning MATLAB and Simulink: From Beginner to Pro; S. Eshkabilov, Apress, 2nd edition.	2022
3	MATLAB: An Introduction with Applications; A. Gilat, John Wiley & Sons Inc., 6th edition.	2017

B. Tech. Production and Industrial Engineering

Course code: Course Title	Course Structure			Pre-Requisite
PE103: Workshop Practice	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to familiarize the students with manufacturing shops like Carpentry, Foundry, Welding, Machining, Fitting and Smithy.

S. No	Course Outcomes (CO)
CO1	Describe the fundamentals of workshop practices.
CO2	Choose appropriate manufacturing processes/tools/techniques for various jobs.
CO3	Practice various tools and machinery to make different jobs in various shops of the workshop.
CO4	Demonstrate various techniques to study about various hazards in workshop and standard safety procedures.
CO5	Eperiment workshop practices in fabrication and integration of various components for research/ project/ professional work.

S. No	Contents
UNIT 1	Carpentry: Study of Different Carpentry Tools and Pattern Making of a given job (pulley/screw jack body).
UNIT 2	Foundry: Study of Different Foundry Tools and Furnaces Making a green sand mould of a given pattern (pulley/screw jack body) and its casting.
UNIT 3	Welding: Arc welding of butt joint, T-joint and lap joint Study of other welding/ joining Techniques.
UNIT 4	Machining: Study of lathe, milling, drilling machine, shaper, planer and grinding machine. Demonstration of a job on lathe.
UNIT 5	Fitting: Study of various fitting hand tools, marking and measuring devices Preparation of a given job (box / funnel).
UNIT 6	Smithy: Study of different forming tools and power press Preparation of a given job (bolt / chisel).

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Manufacturing Processes for Engineering Materials, 6e; Serope Kalpakjian, Steven R. Schmid, Pearson Education.	2018
2	Basic Mechanical Engineering; P. Kumar, Pearson Education, 1/e.	2018

3	Elements Of Workshop Technology Vol-1; S. K. H. Choudhary, A. K. H. Choudhary, N. Roy, Media Promoters.	2008
4	Workshop Technology; W. Chapman, Routledge.	1972
5	Production Engineering, R. K. Jain, Khanna Publishers.	1976

Course code: Course Title	**Course Structure**			**Pre-Requisite**
PE106: Engineering Graphics	**L**	**T**	**P**	**NIL**
	1	**0**	**2**	

Course Objective: The objective of the course is to familiarize the students with drafting and engineering drawing practices.

S. No	**Course Outcomes (CO)**
CO1	Describe the principles of engineering graphics, rules of dimensioning, lettering, scales, types of projections, different planes used in projections.
CO2	Visualize projections of point's lies in different quadrants. Also, they will understand and obtain traces, true lengths shortest length and true angles with horizontal, vertical and auxiliary planes.
CO3	Visualize projections of plane surfaces of different shapes and traces of plane surfaces.
CO4	Define different types of solids and projections and sections of solids which axis parallel, perpendicular and inclined to horizontal planes.
CO5	Experiment application of development of surfaces, draw development of different types of surfaces, and isometric projections of solids with different shapes.

S. No	**Contents**
UNIT 1	General: Importance, Significance and scope of engineering drawing Lettering, Dimensioning, Scales, Sense of Proportioning, Different types of Projections, B.I.S. Specification, line symbols, rules of printing.

UNIT 2	Projections of Points and Lines: Introduction of planes of projection, Reference and auxiliary planes, projections of points and lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on auxiliary planes, shortest distance, intersecting and non-intersecting lines.
UNIT 3	Planes Other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points lines in the planes, conversion of oblique plane into auxiliary plane and solution of related problems.
UNIT 4	Projections of Plane Figures: Different cases of plane figure (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes). Obtaining true shape of the plane figure by projection.
UNIT 5	Projection of Solids: Simple cases when solid is placed in different positions, Axis, faces and lines lying in the faces of the solid making given angles.
UNIT 6	Isometric and Orthographic Views: First and Third angle of system of projection, sketching of Orthographic views from pictorial views and vice –versa, Sectional views.
UNIT 7	Principles of dimensioning.
UNIT 8	Development of lateral surfaces of simple solids.
UNIT 9	Introduction to available drafting softwares like AutoCAD.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Engineering Graphics; K. L. Narayana, P. Kannaiah, Tata McGraw Hill.	1988
2	Engineering Drawing Workbook; N. Kumar, S. C. Sharma, Dhanpat Rai Publishing Company.	2006
3	Engineering Graphics; A. M. Chandra, S. Chandra, CRC Press.	2003

B. Tech. Software Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
SE103: Computer Workshop -I	**L**	**T**	**P**	**NIL**
	0	**0**	**4**	

Course Objective: Students of Software Engineering are to work with various hardware and software not only in academia but also in the company. Thus, students should get familiar with various hardware, software, operating systems, and networking. This course will provide students a much-needed knowledge of computer hardware and networking, enabling them to identify and rectify onboard computer hardware, software, and network-related problems. With the help of this course, the student will be able to understand the hardware specifications that are required to run an operating system and various application programs.

S. No	Course Outcomes (CO)
CO1	Describe the procedure for installation of software on different systems and identify the various components of hardware systems.
CO2	Identify and demonstrate components of computer and operating system and their troubleshooting.
CO3	Describe the basics of Internet and web design.
CO4	Perform the process of software installation.

S. No	Contents
UNIT 1	Assembly/Disassembly of Computers: Hardware peripherals like RAM, ROM, input devices, output devices, processors, etc. Processors and processor core counts and frequency etc. motherboards, internal and external connectors. Types of data cables. LAN, Audio, and Video. The physical set-up of Printers- Scanner set-up, Webcam, Bluetooth device, Memory card reader, etc. Working of SMPS. Connection of different types of devices to the ports (CPU), Single board computer: Raspberry Pi. Assembly/Dis-assembly of Laptop: Mounting of processor. Fixing of the motherboard in the tower case. Connection to the power supply. Installation of drivers. Connection of cables. Mount the memory modules. Install the internal cards. Connection of the external devices and power.

UNIT 2	Computer Network Setup: Networking components, devices, and tools; Preparing the network cables, network setup, configuration and management commands, Installation and configuration of network interface card and identification of MAC address,. Sharing of resources. Software Installations: Installation of Windows Operating System, Types of software and their installations, some useful software (MS office, Adobe Acrobat, Google Chrome, VLC Media Player, LibreOffice, Win Rar).
UNIT 3	PC Maintenance: POST (Power on Self-Test), identifying problems by Beep codes errors, checking power supply using Multi-meter, Replacement of components etc. Introduction to MS office: Introduction to MS office - MS Word, MS PPT, MS Excel, Working with MS Word.
UNIT 4	Tools for Online Teaching and Meetings: Setting & troubleshooting of online meetings and video conferencing like google meet, zoom, Microsoft teams, Webex etc; use of google classroom and google forms for teaching, feedback, and evaluation. Internet and Basic Webpage Design: Searching the Internet, checking the speed of Internet connection, usage of E-Commerce, creating webpage using HTML, CSS with static text, images, tables, audio, video etc and dynamic contents, animation usage and tools for webpages.
UNIT 5	AI & ML Applications: Case studies using module (Blackbox based) integration for AI & ML and its applications.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Assembling and Repairing Personal Computers; Dan L. Beeson, Prentice Hall Certification.	1999
2	Practical Computers Network: Server Configuration Based on Windows; B. K. Kothari, M. Singh, V. Katariya, LAP LAMBERT Academic Publishing.	2017
3	PC Repair & Troubleshooting Guide Paperback; M. E. Soper, BPB Publications.	2017

4	Introduction to Microsoft Windows for Engineering and Technology; James L. Antonakos, Kenneth C. Mansfield Jr., Pearson.	2000
5	Introduction to Artificial Intelligence; Charniak, D. McDermott, Pearson Educaion India.	2002

Course code: Course Title	**Course Structure**			**Pre-Requisite**
SEC106: Computer Workshop-II	**L**	**T**	**P**	**NIL**
	0	**0**	**4**	

Course Objective: Students of Software Engineering require to develop software or product for solving real world problems in academia, and industry. Thus, this course will teach the process of developing a software with feasible solution. Students will gain knowledge about storing the data in a system, using diagrammatic representation and establishing relationship among different attributes of a data. This course will help them in understanding diagrammatically the flow of data among different modules. With the help of this course, students will be able to understand the importance of analyzing problem and it's solution from developer and customer perspective.

S. No	**Course Outcomes (CO)**
CO1	Demonstrate the modelling of data stored in a database.
CO2	Demonstrate the way information is flowing through the system.
CO3	Describe the procedure for designing data flow diagram and context diagram.
CO4	Describe the process of interaction among external entities with an internal software system.
CO5	Demonstrate the process of collecting requirements form the user for software development.

S. No	**Contents**

UNIT 1	Software Requirement: Development of Software Requirement Specification, Software Requirements Analysing tools, Validation of Requirements, Case study based on Requirement Specification Engineering.
UNIT 2	Data Flow Diagrams: Symbols used for constructing DFD, Synchronous and Asynchronous Operations, Data Dictionary, DFD model of a system consisting of hierarchy of DFDs, construction of context diagram, construction of level1 diagram, construction of lower-level diagrams, construction of level 2 diagrams, data dictionary for the DFD model.
UNIT 3	Structure Chart: Extension of DFD technique for designing real-time systems, Structured design, transformation of a DFD Model into structure chart, transform analysis, transaction analysis, and detailed design.
UNIT 4	Microsoft Excel: Manage workbook options and settings, apply custom data formats and layouts, create tables, perform operations with formulas and functions, create charts and objects, manage workbook options and settings, apply advanced conditional formatting and filtering, prepare a workbook for internationalization, create advanced formula, perform data analysis, troubleshoot problems, create, and manage pivot tables, create, and manage pivot charts. Introduction to Structured Query Language: SQL Data Types, SQL Operators, SQL Expressions, SQM Comments, Data Definition Language, Data Manipulation Language, Data Control Language, SQL Functions, SQL Queries and Sub Queries, Case study based on SQL Queries.
UNIT 5	Microsoft PowerPoint: Introduction, windows features, presentation slides, create slide presentation, editing techniques, slide master, format slide, transitions and animation, slide illustration and shapes, slide show, print presentation.

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint

1	Software Requirements and Specifications: A Lexicon of Practice, Principles and Prejudices (ACM Press); M. Jackson, Addison-Wesley Professional.	1995
2	Data Flow Diagrams - Simply Put!: Process Modeling Techniques for Requirements Elicitation and Workflow Analysis: 5; T. Hathaway, A. Hathaway, Createspace Independent Pub.	2016
3	Excel 2021: Everything you need to know about Excel to go from Beginner to Expert; Nora E Wright.	2021
4	Microsoft PowerPoint Guide for Success: Learn in a Guided Way to Create, Edit & Format Your Presentations Documents to Visual Explain Your Projects & Colleagues Big Four Consulting Firms Method;K. Pitch, Top Notch International.	2022