SCHEME AND SYLLABUS

FIRST YEAR

for

BACHELOR OF TECHNOLOGY

in

ELECTRONICS AND COMPUTER ENGG.

(w.e.f. session 2026-2027)

(As per NEP 2020)

(Choice Based Credit Scheme)

DEPARTMENT OF ELECTRONICS ENGINEERING

J. C. BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA, FARIDABAD

VISION

"J.C. Bose University of Science and Technology, YMCA, Faridabad aspires to be a nationally and internationally acclaimed leader in technical and higher education in all spheres which transforms the life of students through integration of teaching, research and character building."

MISSION

- To contribute to the development of science and technology by synthesizing teaching, research and creative activities.
- To provide an enviable research environment and state-of-the-art technological exposure to its scholars.
- To develop human potential to its fullest extent and make them emerge as world class leaders in their professions and enthuse them towards their social responsibilities.

Department of Electronics Engineering

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ABOUT THE DEPARTMENT

The Department of Electronics Engineering at J. C. Bose University of Science & Technology, YMCA, Faridabad (formerly YMCA University of Science & Technology, Faridabad) carries forward a distinguished legacy of technical education and industry-oriented learning. The University, established in 2009, evolved from the erstwhile YMCA Institute of Engineering, Faridabad, which was founded in 1969 as a joint venture between the Government of Haryana and the National Council of YMCA of India, with active support from overseas agencies of West Germany. The institution was established with the vision of developing highly skilled and practically oriented engineering professionals to address the evolving technical manpower requirements of industries.

The Department of Electronics Engineering, established in 1969, has consistently contributed to academic excellence and technological advancement in the field of electronics and allied domains. Since 1997, the Department has been offering undergraduate programmes leading to the B.Tech. degree in Electronics and Communication Engineering, Electronics Engineering (Specialization in Internet of Things), and Electronics and Computer Engineering, each of four years duration. Admissions to the undergraduate programmes are conducted through centralized counselling as nominated by the State Government for first-year admissions, while admissions to the second year are offered through the lateral entry entrance process. In addition to undergraduate education, the Department offers postgraduate programmes leading to the M.Tech. degree in VLSI Design and Electronics & Communication Engineering. The Department also conducts Ph.D. programmes to promote advanced research and innovation in emerging areas of electronics and communication technologies.

All programmes offered by the Department are duly approved by AICTE and UGC and are designed to maintain strong academic standards while addressing contemporary industry requirements. The Department has established a strong reputation for producing competent engineering graduates with an excellent track record of student placements since its inception. To support quality teaching, learning, and research, the Department is equipped with robust academic infrastructure comprising 11 laboratories, 10 lecture halls, one conference room, and six workshops. The Department is supported by a dedicated and experienced faculty team consisting of 3 Professors, 6 Associate Professors, and 15 Assistant Professors. At present, 21 faculty members hold Ph.D. degrees across diverse areas of specialization, contributing significantly to teaching, research, consultancy, and academic development.

The curriculum of undergraduate and postgraduate programmes has been developed with active participation from industry to ensure relevance to current technological trends and professional requirements. The Department regularly organizes expert lectures and technical interactions with industry professionals each semester to strengthen the academic–industry interface. To enhance experiential learning and professional readiness, one semester of internship/training is mandatory for every B.Tech. student. Special emphasis is placed on project-based learning, laboratory practice, and workshop activities to promote innovation, problem-solving ability, and skill enhancement.

The University follows a Choice Based Credit System (CBCS) and NEP, enabling students to pursue elective and audit courses according to their academic interests and career aspirations, thereby encouraging interdisciplinary learning and academic flexibility.

TABLE 1 PROGRAM EDUCATION OBJECTIVES (PEOs)

PEO1	To prepare students to excel in undergraduate programmes and succeed in industry/ technical profession through global, rigorous education.
PEO2	To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and also to pursue higher studies.
PEO3	To provide students with a foundation in skill development required to design, develop and fabricate engineering products.
PEO4	To inculcate in students a professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context, additional courses with regard to physical, psychological and career growth.
PEO5	To provide students with an academic environment aware of excellence, outstanding leadership, written ethical codes and guidelines with moral values, and the life-long learning needed for a successful professional career.

TABLE 2 PROGRAM OUTCOMES (POs)

PO1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems, reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO4	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO5	Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling, recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6	The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with

	reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	Individual and Collaborative Teamwork: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

TABLE 3 PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1	To apply the fundamental and design concepts in the areas of Electronics & Communication, Signal Processing, Image Processing, VLSI and Embedded Systems. (Professional Skill)
PSO2	To apply the fundamental and design concepts of Science & Engineering to understand, analyze, design& develop the Computer Programs /Computer Based Systems in the areas related to Algorithms, Networking, Web Designing, Cloud Computing, IoT, Multimedia and Data Analytics of varying capabilities. (Professional Skill)
PSO3	To pursue higher degree or get placed in Industries & Organizations after qualifying competitive examinations at National & Global Level. (Competitive Skill)

TABLE 4 KNOWLEDGE & ATTITUDE PROFILES

WK1	Natural and Social Science
WK2	Mathematics, Computing, Data Analysis
WK3	Engineering Fundamentals

WK4	Specialized Engineering Knowledge
WK5	Engineering Design and Operations
WK6	Engineering Practice and Technology
WK7	Society, Sustainability, and Professional Responsibility
WK8	Research Literature and Critical Thinking
WK9	Ethics, Professional Responsibility, and Inclusion

TABLE 5 SUSTAINABLE DEVELOPMENT GOALS (SDGs)

SDG 1	**No Poverty** End poverty in all its forms everywhere.
SDG 2	**Zero Hunger** End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
SDG 3	**Good Health and Well-being** Ensure healthy lives and promote well-being for all at all ages.
SDG 4	**Quality Education** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
SDG 5	**Gender Equality** Achieve gender equality and empower all women and girls.
SDG 6	**Clean Water and Sanitation** Ensure availability and sustainable management of water and sanitation for all.
SDG 7	**Affordable and Clean Energy** Ensure access to affordable, reliable, sustainable, and modern energy for all.
SDG 8	**Decent Work and Economic Growth** Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
SDG 9	**Industry, Innovation and Infrastructure** Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
SDG 10	**Reduced Inequalities** Reduce inequality within and among countries.
SDG 11	**Sustainable Cities and Communities** Make cities and human settlements inclusive, safe, resilient, and sustainable.
SDG 12	**Responsible Consumption and Production** Ensure sustainable consumption and production patterns.
SDG 13	**Climate Action** Take urgent action to combat climate change and its impacts.
SDG 14	**Life Below Water** Conserve and sustainably use the oceans, seas, and marine resources.
SDG 15	**Life on Land** Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt biodiversity loss.
SDG 16	**Peace, Justice and Strong Institutions**

	Promote peaceful and inclusive societies, provide access to justice for all, and build effective, accountable, and inclusive institutions.
SDG 17	**Partnerships for the Goals** Strengthen the means of implementation and revitalize the global partnership for sustainable development.

TABLE 6 COURSE CODES AND DEFINITIONS

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities, Social Sciences and Management Courses
PCC	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective Courses
MAC	Mandatory Audit Courses
PR	Project
INT	Internship
SEC	Skill Enhancement Courses
MOOC	Massive Open Online Courses
VAC	Value Added Courses

MANDATORY INDUCTION PROGRAM (3-WEEKS DURATION)

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. A 3-week long induction program for the UG students entering the institution, right at the start, has to be planned. Normal classes will start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

Tentative activities which can be planned in this Induction Programme are as follows:

• Physical Activity

• Creative Arts

• Universal Human Values

• Literary

• Proficiency Modules

• Lectures by Eminent People

• Visits to Local Area

• Familiarization to Dept./Branch & Innovations

GUIDELINES FOR TREE PLANTATION AND CARE

As approved in Academic Council, Tree Plantation is a mandatory activity for every student admitted to J. C. Bose University of Science and Technology, YMCA, Faridabad.

Instructions for Students:

1. **Tree Plantation:** Each admitted student for undergraduate program of the University is required to plant at least 2-5 tree saplings during his/her first or second semester. The selected location for the plantation may be any place of their choice at/near their home places (e.g., parks, grounds, etc.). The student must capture geo-tagged photographs of the planted saplings and ensure to take proper care of their growth. Please note that the student should also be there in the geotagged photo along with the plant.

2. **Submission of Documents:** The student has to submit geo-tagged photographs of the planted saplings on university ERP platform in the given format, namely, plantation document including other details, viz., name of plant, date of plantation, and any additional information regarding the plantation.

3. **Ongoing Care and Monitoring:** After plantation, every student will take care for these plants and submit their updated geo-tagged photos in plantation document for 2nd and 3rd year also.

    - Each student will have to submit the plantation document once in every year of the program.

    - The plantation document including geo-tagged photos will be submitted for (N-1) times, where N is the total duration of the program in which student is admitted. For example, a student of 4 years B.Tech./B.Sc. program has to submit the plantation document for three consecutive years, i.e., till pre-final year indicating the growth and survival of the tree sapling planted by them.

4. **Tree Survival:** The student must ensure the successful survival of at least one tree out of 2-5 initially planted trees for being eligible for their degree.

5. **Verification of Documents:** The verification of submitted documents will be done by the respective teacher coordinator at each successive year during Practical Examinations towards the end of the semester as per the notified academic calendar for the session.

6. **Certificate of Achievement:** The certificate for eligible student will be auto generated, which may be downloaded from their respective ERP platform after due verification. These students will thereby fulfil the requirement for degree conferral within their respective programs.

The students admitted through LEET will take part in the initiative after their admission in 2nd year of respective program and the requirement of submission of geotagged photographs will be (N-2) times for them as per point 3.

EXIT CRITERIA FOR ELECTRONICS & COMPUTER ENGG.

For J. C. Bose University of Science and Technology, YMCA, under the NEP framework, the exit criteria generally require students to secure a minimum of 40% marks in the end-term examinations, in accordance with the University Examination Ordinance. In addition, students must fulfill the prescribed overall credit requirements to be eligible for different exit options—such as Certificate, Diploma, or Degree—aligned with the multiple entry and exit provisions of the National Education Policy and the guidelines of the University Grants Commission. Following table depicts exit option after first year.

TABLE 7 EXIT OPTION DETAILS

S.No.	Level	Semester	Exit Options	Credits	Additional Credits for exit students	List of Exit Courses
1.	4.5	Sem I &II	U.G. Certificate (Electronics and Computer Engineering)	40	4	Minimum 4-6 Weeks of Industrial Internship **OR** Online two skill courses at NCrF/NSQF level 4.5 from NSQF/ESSC/Swayam/ NPTEL/ Any other agency that provides Certification/ Evaluation **OR** Technical Project/ Skill Based Courses offered by the Department.

Exit Option for UG Certificate (Level 4.5): Any student opting for exit option after the second semester will get UG Certificate provided he/she earns 40 Credits of first two semesters and additional 4 credits based on Exit options as per TABLE 8. Thus, he/she will be eligible to exit the course with 44 Credits. In addition, the Internship Report/ Certificate Course/ Technical Project would be evaluated by experts from panel approved by Chairperson, Department of Electronics Engineering, J.C. Bose University of Science and Technology, YMCA, Faridabad.

The skill-based courses equivalent to NCrF/NSQF level 4.5 for Exit option for UG Certificate could be (but not limited to) is shown in Table 8.

TABLE 8 COURSES FOR EXIT OPTION FOR UG CERTIFICATE

S.No.	Course Code	Course name	Credits
1.		MS Office Suite: Deep knowledge of Excel (data entry, formulas, charts) and Word (formatting, mail merge)/ Digital Electronics **(Any one course)**	2 each
2.		PC Workshop Lab	2 each

EMPLOYMENT PATHWAYS AFTER EXIT FOR UG CERTIFICATE:

1. Exit Qualification: UG Certificate

2. NSQF/NCrF Level: 4.5

3. Associated Industry Sectors: Electronics Manufacturing Services (EMS), Computer Hardware and Networking, Information Technology (IT) and IT Enabled Services (ITES), Telecommunications, Consumer Electronics, Industrial Automation, and Electronics Repair and Maintenance Services.

4. Mapped Job Roles: Electronics Technician, Computer Hardware Technician, IT Support Assistant, Desktop Support Technician, PCB Assembly and Testing Technician, Junior Field Service Technician, and Data Entry/MIS Assistant

5. Possibility of re-entry into higher semesters through Academic Bank of Credits (ABC).

TABLE 9 SEMESTER-WISE SUMMARY OF THE FIRST YEAR

S.No.	Semester	Contact Hours	Marks	Credits
1.	I	26 per week	725	19
2.	II	27 per week	800	21
3.	Tree Plantation	-	25	1#

Note: A student has to earn at least 6 credits during the duration of Degree subject to passing at least two MOOC courses of 12-week duration (carrying a minimum of 3 credits) through the SWAYAM Platform.

A student has to earn 1 credit for the Tree Plantation Activity.

TABLE 10 PROGRAMME CORE COURSES (PCC)

S.No.	Course Code	Course Title	Classroom Instruction (CI) in hours per week per semester		Lab Instruction (LI) in hours per week per semester	Total Instruction (CI+LI) per week per semester	Total contact hours @15 weeks per semester	Team Work (TW) and Self Learning (SL) in hours per semester	Contact Hours required @30 hours per credit	Total Credits@30 hours per Credit	Semester
			L	T	P	Total					
1	EEU-101-V1	Discipline Specific Course-I (Fundamentals of Electronics Engineering)	3	-	-	3	45	45	90	**3**	II
2	EEU-103-V1	Discipline Specific Course-II (Python Lab Electronics Engineering)	-	-	2	2	30	0	30	**1**	II
		Total	**3**	**0**	**2**	**5**	**75**	**45**	**120**	**4**	

TABLE 11 BASIC SCIENCE COURSES (BSC)

S.No.	Course Code	Course Title	Classroom Instruction (CI) in hours per week per semester		Lab Instruction (LI) in hours per week per semester	Total Instruction (CI+LI) per week per semester	Total contact hours @15 weeks per semester	Team Work (TW) and Self Learning (SL) in hours per semester	Contact Hours required @30 hours per credit	Total Credits@30 hours per Credit	Semester
			L	**T**	**P**	**Total**					
1	MTU-147-V1	Mathematics-I	3	1	-	4	60	60	120	**4**	I
2	PHU-153-V1	Physics (Waves and Optics)	3	-	-	3	45	45	90	**3**	I
3	PHU-159-V1	Physics (Waves and Optics) Lab	-	-	2	2	30	0	30	**1**	I
4	ENU-101-V1	Biology for Engineers	2	-	-	2	30	30	60	**2**	I
5	CHU-141-V1	Chemistry	3	-	-	3	45	45	90	**3**	II
6	CHU-142-V1	Chemistry Lab	-	-	2	2	30	0	30	**1**	II
7	MTU-148-V1	Mathematics-II	3	1	-	4	60	60	120	**4**	II
		Total	**14**	**2**	**4**	**20**	**300**	**240**	**540**	**18**	

TABLE 12 ENGINEERING SCIENCE COURSES (ESC)

S.No.	Course Code	Course Title	Classroom Instruction (CI) in hours per week per semester		Lab Instruction (LI) in hours per week per semester	Total Instruction (CI+LI) per week per semester	Total contact hours @15 weeks per semester	Team Work (TW) and Self Learning (SL) in hours per semester	Contact Hours required @30 hours per credit	Total Credits @ 30 hours per Credit	Semester
			L	T	P	Total					
1	MEU-103-V1	Engineering Graphics and 2D Modelling	-	-	4	4	60	0	60	**2**	I
2	CSU-101-V1	Programming for Problem Solving	3	-	-	3	45	45	90	**3**	I
3	CSU-103-V1	Programming for Problem Solving lab	-	-	2	2	30	0	30	**1**	I
4	MEU-101-V1	Workshop-I	-	-	4	4	60	0	60	**2**	II
5	ELU-151-V1	Fundamentals of Electrical Engineering	3	-	-	3	45	45	90	**3**	II
6	ELU-153-V1	Fundamentals of Electrical Engineering Laboratory	-	-	2	2	30	0	30	**1**	II
7	MEU-102-V1	Workshop-II	-	-	4	4	60	0	60	**2**	I
		Total	**6**	**0**	**16**	**22**	**330**	**90**	**420**	**14**	

TABLE 13 HUMANITIES, SOCIAL SCIENCES AND MANAGEMENT COURSES (HSMC)

S.No.	Course Code	Course Title	Classroom Instruction (CI) in hours per week per semester		Lab Instruction (LI) in hours per week per semester	Total Instruction (CI+LI) per week per semester	Total contact hours @15 weeks per semester	Team Work (TW) and Self Learning (SL) in hours per semester	Contact Hours required @30 hours per credit	Total Credits @ 30 hours per Credit	Semester
			L	T	P	Total					
1	ENG-101-V1	English	2	-	-	2	30	30	60	**2**	II
2	ENG-103-V1	English Lab	-	-	2	2	30	0	30	**1**	II
		Total	**2**	**0**	**2**	**4**	**60**	**30**	**90**	**3**	

TABLE 14 VALUE ADDED COURSES (VAC)

S.No.	Course Title	Classroom Instruction (CI) in hours per week per semester		Lab Instruction (LI) in hours per week per semester	Total Instruction (CI+LI) per week per semester	Total contact hours @15 weeks per semester	Team Work (TW) and Self Learning (SL) in hours per semester	Contact Hours required @30 hours per credit	Total Credits @ 30 hours per Credit	Semester
		L	T	P	Total					
1	VAC Elective	-	-	2	2	30	0	30	**1**	I
	Total	**0**	**0**	**2**	**2**	**30**	**0**	**30**	**1**	

TABLE 15 VALUE ADDED COURSES (VAC)

S.No.	Course Code	Course Title	Hours Per Week	Total Credits	Semester
1.	VAC-112-V1	VAC-I (Constitution of India)	2	1	I
2.	VAC-105-V1	VAC-II (Universal Human Values)	2	1	I
3.	AEC-106-V1	VAC-III (Message of Bhagavad Gita)	2	1	I
4.	VAC-115-V1	VAC-IV (Essence of Indian Traditional Knowledge)	2	1	I
Total			**2**	**1**	

Students have to select any one Value Added Course from the list of courses.

TABLE 16 GRADING SCHEME

Marks %	Grade	Grade points	Category
90-100	O	10	Outstanding
80≤ marks<90	A+	9	Excellent
70≤marks< 80	A	8	Very good
60≤ marks< 70	B+	7	Good
50≤ marks< 60	B	6	Above average
45≤ marks< 50	C	5	Average
40≤marks< 45	P	4	Pass
<40	F	0	Fail
	Ab	0	Absent

Percentage Calculation= CGPA * 9.5

Cumulative Grade Point Average (CGPA)

A student is required to maintain a Cumulative Grade Point Average (CGPA) which is the weighted average of all the Letter Grades obtained by the student since his/ her entry into the University upto and including the latest semester and is computed as follows:

$$CGPA= \sum(C_i G_{i)} / C_i$$

Where, C_i denotes the credits assigned to i^{th} course and G_i indicates the Grade Point Equivalent to the Letter Grade obtained by the student to the i^{th} course. Provided that when a student re-appears in/ repeats a course, the new Grade will replace the earlier one in the calculation of the CGPA.

Note:

At the end of the semester (i.e. after End Semester Examination), students will be supplied a DMC indicating the grades secured in each course, Semester Grade Point Average (SGPA) and up-to-date CGPA.

B.TECH.

ELECTRONICS AND COMPUTER ENGINEERING

(I & II SEMESTER)

J. C. BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA, FARIDABAD
B. Tech. Electronics and Computer Engineering
[Level 4.5, UG Regular] I Year, Semester – I
(2026-27) (As per NEP 2020)

TABLE 17 SCHEME FOR SEMESTER – I

Course Notation	Course Code	Course Title	Teaching Schedule				Marks for Sessionals	Marks for End Term Examinations		Total Marks	Credits	Course Type
			L	T	P	Total		Theory	Practical			
B	PHU-153-V1	Physics (Waves and Optics)	3	-	-	3	40	60	-	100	3	BSC
C	MTU-147-V1	Mathematics-I	3	1	-	4	40	60	-	100	4	BSC
A	ELU-151-V1	Fundamentals of Electrical Engineering	3	-	-	3	40	60	-	100	3	ESC
B	MEU-103-V1	Engineering Graphics and 2D Modelling	-	-	4	4	50	-	50	100	2	ESC
A	CHU-141-V1	Chemistry	3	-	-	3	40	60	-	100	3	BSC
B	CSU-101-V1	Programming for Problem Solving	3	-	-	3	40	60	-	100	3	ESC
A	MEU-101-V1	Workshop-I	-	-	4	4	50	-	50	100	2	ESC
B	MEU-102-V1	Workshop-II	-	-	4	4	50	-	50	100	2	ESC

A	ENG-101-V1	English	2	-	-	2	40	60	-	100	2	HSMC
B	PHU-159-V1	Physics Lab (Waves and Optics)	-	-	2	2	25	-	25	50	1	BSC
A	ELU-153-V1	Fundamentals of Electrical Engineering Laboratory	-	-	2	2	25	-	25	50	1	ESC
A	CHU-142-V1	Chemistry Laboratory	-	-	2	2	25	-	25	50	1	BSC
B	CSU-103-V1	Programming for Problem Solving Lab	-	-	2	2	25	-	25	50	1	ESC
A	ENG-103-V1	English Lab	-	-	2	2	25	-	25	50	1	HSMC
B	ENU-101-V1	Biology for Engineers	2	-	-	2	40	60	-	100	2	BSC
B	-	VAC Elective	-	-	2	2	25	-	-	25	1	VAC
D	EEU-101-V1	Discipline Specific Course-I (Fundamentals of Electronics Engineering)	3	-	-	3	40	60	-	100	3	PCC
D	EEU-103-V1	Discipline Specific Course-II (Python Lab for Electronics Engineering)	-	-	2	2	25	-	25	50	1	PCC

Note: Exams duration will be as under

a. Theory exams will be of 03 hours duration.

b. Practical exams will be of 02 hours duration

c. Workshop exam will be of 03 hours duration

Important Notes:

Significance of the Course Notations used in this scheme:

C = These courses are common to both the groups Group-1 and Group-2.
A = Other compulsory courses for Group-1.
B = Other compulsory courses for Group-2.
D = Discipline Specific Course

Students will study either:
Group 1=A + C +D

or

Group 2=B + C

J. C. BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA, FARIDABAD
B. Tech. Electronics and Computer Engineering
[Level 4.5, UG Regular] I Year, Semester – II
(2026-27) (As per NEP 2020)

TABLE 18 SCHEME FOR SEMESTER – II

Course Notation	Course Code	Course Title	Teaching Schedule				Marks for Sessionals	Marks for End Term Examinations		Total Marks	Credits	Course Type
			L	T	P	Total		Theory	Practical			
A	PHU-153-V1	Physics (Waves and Optics)	3	-	-	3	40	60	-	100	3	BSC
C	MTU-148-V1	Mathematics-II	3	1	-	4	40	60	-	100	4	BSC
B	ELU-151-V1	Fundamentals of Electrical Engineering	3	-	-	3	40	60	-	100	3	ESC
A	MEU-103-V1	Engineering Graphics and 2D Modelling	-	-	4	4	50	-	50	100	2	ESC
B	CHU-141-V1	Chemistry	3	-	-	3	40	60	-	100	3	BSC
A	CSU-101-V1	Programming for Problem Solving	3	-	-	3	40	60	-	100	3	ESC
B	MEU-101-V1	Workshop-I	-	-	4	4	50	-	50	100	2	ESC
A	MEU-102-V1	Workshop-II	-	-	4	4	50	-	50	100	2	ESC
B	ENG-101-V1	English	2	-	-	2	40	60	-	100	2	HSMC
A	PHU-159-V1	Physics Lab (Waves and Optics)	-	-	2	2	25	-	25	50	1	BSC
B	ELU-153-V1	Fundamentals of Electrical	-	-	2	2	25	-	25	50	1	ESC

		Engineering Laboratory										
B	CHU-142-V1	Chemistry Laboratory	-	-	2	2	25	-	25	50	1	BSC
A	CSU-103-V1	Programming for Problem Solving lab	-	-	2	2	25	-	25	50	1	ESC
B	ENG-103-V1	English Lab	-	-	2	2	25	-	25	50	1	HSMC
A	ENU-101-V1	Biology for Engineers	2	-	-	2	40	60	-	100	2	BSC
A	-	VAC Elective	-	-	2	2	25	-	-	25	1	VAC
D	EEU-101-V1	Discipline Specific Course-I (Fundamentals of Electronics Engineering)	3	-	-	3	40	60	-	100	3	PCC
D	EEU-103-V1	Discipline Specific Course-II (Python Lab for Electronics Engineering)	-	-	2	2	25	-	25	50	1	PCC

Note: Exam duration will be as under
a. Theory exams will be of 03 hours duration.

b. Practical exams will be of 02 hours duration.

c. Workshop exam will be of 03 hours duration.

Important Notes:
Significance of the Course Notations used in this scheme: -

C = These courses are common to both the groups Group-1 and Group-2.
A = Other compulsory courses for Group-1.
B = Other compulsory courses for Group-2.
D = Discipline Specific Course

Students will study either

Group 1 = A + C
or
Group 2 = B + C + D

Exit Option for UG Certificate (Level 4.5): Any student opting for the exit option after the second semester will get the UG Certificate provided he/she earns 40 Credits of the first two semesters and an additional 4 credits based on Exit options as per TABLE 8. Thus, he/she will be eligible to exit the course with 44 Credits. In addition, the Internship Report/ Certificate Course/ Technical Project would be evaluated by experts from a panel approved by the Chairperson, Department of Electronics Engineering, J.C. Bose University of Science and Technology, YMCA, Faridabad.

SYLLABUS CONTENTS

PHU-153-V1 PHYSICS (WAVES & OPTICS)

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		3	
L	**T**	**P**	**Total**
3	**0**	**0**	**3**

Sessional	**40 Marks**
Theory	**60 Marks**
Total	**100 Marks**
Duration of Exam	**3 Hours**

Pre- Requisite: Nil

Course Objective:

This course provides fundamental knowledge of wave optics, oscillations, lasers, fiber optics, and geometrical optics. Students will understand interference, diffraction, SHM, laser principles, optical fibers, and light propagation, while developing analytical, numerical, and problem-solving skills for applications in modern optical and physical systems.

Course Contents:

UNIT-I: Wave Optics

Interference: Coherent sources, conditions for sustained interference, Analytical treatment of interference, Division of Wave-Front - Fresnel's Biprism, Division of Amplitude- Interference by a plane parallel film, Newton's Rings, Michelson Interferometer, applications (Resolution of closely spaced spectral lines, determination of wavelengths).

Diffraction: Difference between interference and diffraction Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Plane transmission diffraction grating (qualitative), absent spectra, dispersive power, resolving power and Rayleigh criterion of resolution.

[WK1, WK2, WK3]

UNIT-II: Simple Harmonic Motion, Damped and Forced Harmonic Oscillator

Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

[WK1, WK2, WK3, WK7]

UNIT III: Laser and Fiber Optics

Einstein's theory of matter-radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne), solid-state lasers (ruby), dye lasers; Properties of laser beams: monochromaticity, coherence, directionality and brightness, applications of lasers
Propagation of light in optical fibers, numerical aperture, V-number, single and multimode fibers, Elementary idea of attenuation and dispersion, applications.

[WK1, WK2, WK3, WK7, WK8, WK9]

UNIT-IV: The Propagation of Light and Geometric Optics

Fermat's principle of stationary time and its applications, mirage effect, laws of reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave.

[WK1, WK2, WK3, WK7, WK9]

Reference Books:

1. Perspectives of Modern Physics - Arthur Beiser (TMH)
2. Optics –Ajoy Ghatak (TMH)
3. Modern Physics for Engineers – S.P. Taneja (R. Chand)
4. Engineering Physics (vol-1)- S.L. Gupta (Dhanpat Rai)
5. Fundamentals of Physics – Resnick & Halliday (Asian Book)

Course Outcome:

After the successful completion of the course, the students are expected to:

CO 1: Apply interferometric techniques for wavelength determination and resolution of spectral lines.
CO 2: Evaluate energy decay and quality factor in damped oscillators.
CO 3: Identify practical applications of optical fibers in communication and sensing technologies.
CO 4: Solve numerical problems related to interference, diffraction, oscillations, lasers, and fibre optics.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	1	-	-	-	1	-	1	3	2
CO2	3	2	1	-	2	1	-	-	1	-	1	3	2
CO3	3	3	1	1	2	2	-	-	1	-	1	3	2
CO4	3	2	2	1	2	1	-	-	1	-	1	3	2

Contribution to SDGs:

The course Waves and Optics is most strongly aligned with **SDG 4** (Quality Education), **SDG 8** (Decent work and Economic Growth), **SDG 9** (Industry, Innovation and Infrastructure), **SDG 12** (Responsible Consumption and Production) and **SDG 17** (Partnerships for the Goals.

PHU-159-V1 PHYSICS LAB (WAVES & OPTICS)

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		1	
L	**T**	**P**	**Total**
0	**0**	**2**	**1**

Sessional	**25 Marks**
Practical	**25 Marks**
Total	**50 Marks**
Duration of Exam	**2 Hours**

Pre- Requisite: Waves and Optics Theory

Course Objective:

This course complementary lab course for waves and optics which provides practical knowledge of different fundamental topics learned in the theory part of the course.

Contents:

Each student need to perform at least 6 experiments from the following:

1. To determine the frequency of an electric tuning fork by Melde's experiment and verify λ^2 –T law.
2. Familiarization with: Schuster`s focusing; determination of angle of prism.
3. To determine the refractive index of the Material of a prism using sodium source.
4. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
5. To determine the wavelength of sodium source using Michelson's interferometer.
6. To determine wavelength of sodium light using Fresnel's Biprism.
7. To determine wavelength of sodium light using Newton's Rings.
8. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
9. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
10. To determine dispersive power and resolving power of a plane diffraction grating.
11. To verify the Malus's law for plane polarized light.
12. To determine specific rotation of sugar solution using half-shade polarimeter.
13. To determine acceleration due to gravity using simple pendulum.

[WK1, WK2, WK3, WK7, WK9]

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., 1511, Kitab Mahal.
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
4. A Laboratory Manual of Physics for undergraduate classes, D.P. Khandelwal, 1985, Vani Pub.

Course Outcome:

After the successful completion of the laboratory course, the students are expected to:

CO 1: Apply interferometric techniques for wavelength determination and resolution of spectral lines.
CO 2: Evaluate energy decay and quality factor in damped oscillators.
CO 3: Identify practical applications of optical fibers in communication and sensing technologies.
CO 4: Solve numerical problems related to interference, diffraction, oscillations, lasers, and fibre optics.
CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	1	-	-	-	1	-	1	3	2
CO2	3	2	1	-	2	1	-	-	1	-	1	3	2
CO3	3	3	1	1	2	2	-	-	1	-	1	3	2
CO4	3	2	2	1	2	1	-	-	1	-	1	3	2

Contribution to SDGs:

The course Waves and Optics is most strongly aligned with **SDG 4** (Quality Education), **SDG 8** (Decent work and Economic Growth), **SDG 9** (Industry, Innovation and Infrastructure), **SDG 12** (Responsible Consumption and Production) and **SDG 17** (Partnerships for the Goals).

MTU-147-V1 MATHEMATICS-I

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		4	
L	T	P	Total
3	1	0	4

Sessional	40 Marks
Theory	60 Marks
Total	100 Marks
Duration of Exam	3 Hours

Pre-requisites: Basic understanding of algebra, trigonometry, coordinate geometry, and elementary differential and integral calculus.

Course Objectives

1. To develop an understanding of convergence and divergence of infinite series.
2. To apply differential and multivariable calculus techniques to engineering problems.
3. To use integral calculus for computing areas, volumes, and related engineering quantities.
4. To apply vector calculus and integral theorems in physical and engineering applications.

Unit 1: Infinite Series

Convergence and divergence; comparison tests; D'Alembert's ratio test; integral test; Raabe's test; logarithmic and Cauchy root tests; Gauss's test; alternating series; absolute and conditional convergence.

[WK1, WK2, WK3]

Unit 2: Differential Calculus

Successive differentiation; Leibnitz theorem and applications; Taylor's and Maclaurin's series; curvature and asymptotes.

Functions of two or more variables; limit and continuity; partial derivatives; total differential and differentiability; derivatives of composite and implicit functions; Jacobians; higher-order partial derivatives; homogeneous functions; Euler's theorem and applications; Taylor's series for functions of two variables (without proof); maxima and minima of two variables; Lagrange's method of undetermined multipliers; differentiation under integral sign (Leibnitz rule).

[WK1, WK2, WK3, WK4]

Unit 3: Integral Calculus

Applications of single integration to find volumes and surface areas of solids of revolution; double integrals; change of order of integration; double integrals in polar coordinates; applications to areas enclosed by plane curves; triple integrals; change of variables; volumes of solids; beta and gamma functions and their relationship between them.

[WK1, WK2, WK3, WK4]

Unit 4: Vector Calculus

Differentiation of vectors; scalar and vector point functions; gradient of a scalar field and directional derivative; divergence and curl of a vector field and their physical interpretations; integration of vectors; line, surface, and volume integrals; Green's, Stokes', and Gauss theorems (without proof) and their applications.

[WK1, WK2, WK3, WK4, WK6]

Reference Books

1. E. Kreyszig, Advanced Engineering Mathematics, Wiley India.
2. G. B. Thomas and R. L. Finney, Calculus and Analytic Geometry, Narosa Publishing.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing.

Course Outcomes

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

CO1: Apply mathematical concepts and techniques to physical sciences and engineering problems.

CO2: Identify, formulate, and solve engineering problems using differential and integral calculus.

CO3: Model physical and engineering situations using multivariable and vector calculus.

CO4: Analyze and solve problems involving infinite series, differential calculus, integral calculus, and vector calculus.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	1	-	1	3	1
CO2	3	3	2	2	1	-	-	-	1	-	1	3	2
CO3	3	3	3	2	1	1	-	-	1	-	1	3	2
CO4	3	2	2	2	1	1	-	-	1	-	1	3	1

Contribution to SDGs:

This course contributes primarily to **SDG 4: Quality Education** by developing strong mathematical foundations, logical reasoning, analytical ability, and problem-solving skills essential for engineering education and lifelong learning. It supports **SDG 8: Decent Work and Economic Growth** by strengthening quantitative and computational competencies that improve students' employability and their ability to contribute effectively in engineering, research, and technology-driven industries. The course significantly contributes to **SDG 9: Industry, Innovation and Infrastructure** because differential calculus, integral calculus, multivariable analysis, infinite series, and vector calculus are fundamental tools for engineering design, modelling, optimization, simulation, infrastructure planning, and technological innovation. It also supports S**DG 11: Sustainable Cities and Communities** through mathematical modelling of transportation systems, structural designs, fluid flow, energy distribution, and urban infrastructure. Further, it contributes to **SDG 12: Responsible Consumption and Production** by enabling optimization of materials, processes, energy, and resources. Applications of vector calculus, gradients, divergence, curl, surface integrals, and volume integrals also support **SDG 13: Climate Action** by providing the mathematical basis for environmental modelling, renewable energy analysis, fluid dynamics, heat transfer, pollution dispersion, and climate-related simulations. Finally, the course contributes to **SDG 17: Partnerships for the Goals** by providing a common quantitative language for interdisciplinary collaboration among engineers, scientists, researchers, industries, and policymakers working on sustainable development challenges.

CSU-101-V1 PROGRAMMING FOR PROBLEM SOLVING

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		3	
L	**T**	**P**	**Total**
3	**0**	**0**	**3**

Sessional	**40 Marks**
Theory	**60 Marks**
Total	**100 Marks**
Duration of Exam	**3 Hours**

Pre- Requisite: Nil

Course Objective

1. To provide a strong foundation in programming concepts and computational thinking using the C programming language.
2. To develop analytical and problem-solving skills through the design and implementation of algorithms and structured programs.
3. To familiarize students with advanced programming concepts such as functions, arrays, pointers, structures, dynamic memory allocation, and file handling.
4. To enable students to develop efficient, reliable, and maintainable software solutions that form the basis for advanced courses in computer science and engineering.

Unit 1: Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, operating system, compilers etc.), Algorithm: idea, characteristics, Representation (Flowchart/Pseudocode with examples). Source code, constants and variables, data types, Syntax and Logical Errors in compilation, object and executable code.

Operators and precedence, expression evaluation, Conditional branching: if statement, if-else, nested if-else, switch case statement, Loops: For loop, while loop, do-while loop.

[WK2, WK3, WK6]

Unit 2: Arrays and Basic Algorithms

Arrays (1-D,2-D), Character arrays and strings, searching, basic sorting algorithms (Bubble, Insertion and Selection), finding roots of equations, notion of order of complexity through example programs (no formal definition required).

[WK2, WK3, WK4, WK5]

Unit 3: Function and Recursion

Functions (including using built in libraries), parameter passing in functions, call by value, passing arrays to functions: idea of call by reference. Recursion as a different way of solving problems. Example programs, such as finding factorial, Fibonacci series, Ackerman function etc. Quick sort/ Merge sort.

[WK2, WK3, WK4, WK6]

Unit 4: STRUCTURE, POINTERS AND FILE HANDLING

Structures, defining structures and Array of Structures. Idea of pointers, defining pointers, use of Pointers in self-referential structures, notion of linked list (no implementation)

File Handling: Need for file handling, perform operations on file. (only if time is available, otherwise should be done as part of the lab).

[WK3, WK4, WK6]

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
3. Yashavant P. Kanetkar, Let Us C, BNB Publications.
4. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
5. Jeri R. Hanly & Elliot B. Koffman, Problem Solving and Program Design in C, Pearson.

Course Outcomes

At the successful completion of the course, the student shall have the ability to:

CO1: Apply the fundamental concepts of C programming, including data types, operators, control structures, and functions, to develop structured programs.

CO2: Design and implement algorithms to solve engineering and computational problems using appropriate programming constructs.

CO3: Utilize arrays, pointers, structures, dynamic memory allocation to develop efficient software solutions.

CO4: Analyze, test, debug, and optimize C programs while adhering to standard coding practices and software development principles.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	2	-	-	-	-	-	1	3	1
CO2	3	3	3	2	2	-	-	-	-	1	1	3	2
CO3	3	3	3	2	3	-	-	-	-	-	1	3	3
CO4	2	3	2	3	3	-	-	1	-	1	2	2	3

Contribution to SDGs:

The course Programming for Problem Solving is most strongly aligned with SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure), and SDG 12 (Responsible Consumption and Production) because it develops computational thinking, algorithmic problem-solving, and programming skills that form the foundation of software development and digital innovation. The course equips students to design efficient, reliable, and maintainable programs, enabling them to contribute to technological advancement, automation, and sustainable digital solutions while promoting the efficient use of computational resources and best programming practices.

CSU-103-V1 PROGRAMMING FOR PROBLEM SOLVING LAB

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		1	
L	**T**	**P**	**Total**
0	**0**	**2**	**2**

Sessional	**25 Marks**
Practical	**25 Marks**
Total	**50 Marks**
Duration of Exam	**2 Hours**

Course Objective

This course aims to develop computational thinking and problem-solving skills by enabling students to formulate algorithms and implement efficient solutions using the C programming language. The course provides a strong foundation in structured programming concepts, including data types, control structures, functions, arrays, pointers, structures, recursion, file handling, and dynamic memory allocation. It emphasizes program design, debugging, testing, and the use of modular programming techniques to solve engineering problems efficiently. The course also prepares students with the programming skills and analytical abilities required for advanced courses in computer engineering and real-world software development.

List of Experiments*:*

Operators (1-10)

1. Write a program to add two numbers.
2. Write a program to subtract two numbers.
3. Write a program to multiply two numbers.
4. Write a program to divide two numbers.
5. Write a program to find the remainder using modulus operator.
6. Write a program to find the largest of two numbers.
7. Write a program to find the largest of three numbers.
8. Write a program to check whether a number is even or odd.
9. Write a program to check whether a number is positive, negative, or zero.
10. Write a program to check whether a year is a leap year.

Loops (11-24)

11. Write a program to print numbers from 1 to N.
12. Write a program to print numbers from N to 1.
13. Write a program to print all even numbers from 1 to N.
14. Write a program to print all odd numbers from 1 to N.
15. Write a program to find the sum of first N natural numbers.

16. Write a program to calculate the factorial of a number.
17. Write a program to generate the Fibonacci series.
18. Write a program to check whether a number is prime.
19. Write a program to reverse a number.
20. Write a program to check whether a number is palindrome.
21. Write a program to find the sum of digits of a number.
22. Write a program to count the digits in a number.
23. Write a program to print a multiplication table of a number.
24. Write a program to print a star pattern.

Arrays (25-36)

25. Write a program to store and display elements of an array.
26. Write a program to find the sum of array elements.
27. Write a program to find the largest element in an array.
28. Write a program to find the smallest element in an array.
29. Write a program to reverse an array.
30. Write a program to search an element using linear search.
31. Write a program to search an element using binary search.
32. Write a program to sort an array using bubble sort.
33. Write a program to sort an array using selection sort.
34. Write a program to sort an array using insertion sort.
35. Write a program to calculate the average of array elements.
36. Write a program to find the second largest element in an array.

Functions (37-41)

37. Write a program to calculate the area of a circle using a function.
38. Write a program to find the factorial of a number using a function.
39. Write a program to check whether a number is prime using a function.
40. Write a program to calculate the power of a number using a function.
41. Write a program to find the GCD of two numbers using a function.

Recursion (42-44)

42. Write a program to find the factorial of a number using recursion.

43. Write a program to generate Fibonacci series using recursion.

44. Write a program to find the sum of array elements using recursion.

Structures (45-46)

45. Write a program to store student details using structures.

46. Write a program to store employee details using structures.

Pointers (47-49)

47. Write a program to swap two numbers using pointers.

48. Write a program to find the sum of array elements using pointers.

49. Write a program to demonstrate dynamic memory allocation using malloc().

File Handling (50)

50. Write a program to read from and write to a file.

[WK2, WK3, WK4, WK5, WK8]

References:

1. E. Balagurusamy, **Programming in ANSI C**, 8th Edition, McGraw Hill Education, 2019.
2. Brian W. Kernighan and Dennis M. Ritchie, **The C Programming Language**, 2nd Edition, Pearson Education.
3. Yashavant P. Kanetkar, **Let Us C**, 18th Edition, BPB Publications.
4. Byron S. Gottfried, **Programming with C**, Schaum's Outline Series, McGraw Hill.
5. Reema Thareja, **Programming in C**, Oxford University Press.

Course Outcomes

1. After successful completion of the laboratory, the students will be able to:
2. **CO1:** Perform basic electrical measurements and experimentally verify fundamental circuit laws and network theorems in DC circuits. ((Bloom's Level: Apply – L3)
3. **CO2:** Analyze the performance of single-phase and three-phase AC circuits, resonance, and electrical power measurements through laboratory experiments. (Bloom's Level: Analyze – L4)
4. **CO3:** Conduct basic tests on transformers and identify the constructional features and operating principles of electrical machines. (Bloom's Level: Apply – L3)
5. **CO4:** Explain the fundamentals of conventional power generation, renewable energy systems, and electric vehicle technologies through laboratory demonstrations and simulation tools. (Bloom's Level: Understand – L2)

Web links:

1. https://nptel.ac.in/courses/106105171
2. https://nptel.ac.in
3. https://www.geeksforgeeks.org/c-programming-language/
4. https://www.programiz.com/c-programming
5. https://www.tutorialspoint.com/cprogramming
6. https://gcc.gnu.org

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	3	–	–	–	1	1	–	2	3	2
CO2	3	3	3	2	3	–	–	–	1	1	–	2	3	3
CO3	3	3	3	2	3	–	–	–	2	1	–	2	3	3
CO4	3	3	3	3	3	–	–	–	1	1	1	3	3	3

Contribution to SDGs:

This course primarily contributes to SDG 4 (Quality Education) by developing computational thinking, programming skills, and problem-solving abilities among engineering students. It also supports SDG 9 (Industry, Innovation and Infrastructure) by equipping learners with fundamental programming knowledge required for software development, automation, and digital innovation. Furthermore, the course promotes SDG 8 (Decent Work and Economic Growth) by enhancing employability and technical competencies, and SDG 12 (Responsible Consumption and Production) by encouraging the development of efficient, optimized, and resource-conscious software solutions.

ENU-101-V1 BIOLOGY FOR ENGINEERS

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		2	
L	**T**	**P**	**Total**
2	**0**	**0**	**2**

Sessional	**40 Marks**
Theory	**60 Marks**
Total	**100 Marks**
Duration of Exam	**3 Hours**

Course Objectives: To develop and understanding of construct of cellular life forms and their use for various technological uses.

Unit 1: Cell as Basic Unit of Life

Introduction to cell. Concept of prokaryotic and eukaryotic cells. Ultrastructure of eubacterial, plant and animal cells. Functions of different components of the cell.

Cell division cycles: mitosis and meiosis.

Cell to cell signalling: concept, types including quorum sensing, contact dependent, paracrine, synaptic, endocrine and autocrine signalling

[WK1, WK3, WK6, WK7]

Unit 2: Biomolecules and Biocatalysts

Biomolecules: Properties, classification and functions of Carbohydrates, Nucleic acids, proteins, lipids.

Enzymes: Properties, Classification, Mechanism of enzyme action (Michaelis Menton plot), Factors affecting enzyme activity

Classification and functions of hormones and vitamins.

[WK1, WK2, WK3, WK4, WK6]

Unit 3: Adaptations and Applications For Bioengineering

Brain as a CPU system. Eye as a Camera system. Heart as a pump system. Lungs as purification system. Kidney as a filtration system, Microbial cell factories, Microbial fuel cells. Enzymes in biosensors, food processing, detergent formulation, textile processing. PHA and PLA in bioplastics. Biosurfactants and bioemulsifiers. Human blood substitutes

[WK3, WK4, WK5, WK6, WK7]

Unit 4: Applications for Biomedical Engineering and Biocomputing

Introduction to biomedical engineering, Bioinstrumentation: Diagnostic and Therapeutic devices; Bio-medical imaging: Principle, types and examples, Electrical tongue and electrical nose in food science.

Introduction to bioinformatics, Bioinformatics analysis of DNA Microarray, FASTA and BLAST, Bioinformatics tools for various applications- Clustal family, BioEdit, MEGA, Arlequin, Protein structure prediction and visualization tools.

[WK2, WK4, WK6, WK7, WK8]

References:

1. Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2000). Lehninger principles of biochemistry. New York: Worth Publishers.
2. Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.
3. Palsson B.O. and Bhatia S.N. (2009) Tissue Engineering. Pearson.
4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
5. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
6. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
7. Shu Chien, Peter C Y Chen & Y C Fung (Ed.) (2000) An Introductory Text to Bioengineering. World Scientific.

8. Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016
9. NPTEL Course on Biology for engineers and other non-biologists (4 weeks UG Course) By Prof. G.K. Suraishkumar & Prof. Madhulika Dixit (IIT. Madras)

Course Outcomes:

Students will be able to
CO1: Develop an understanding of cell and cellular functions
CO2: Generate understanding of various biomolecules and their potential industrial/environmental applications.
CO3: Correlate biological structures and functioning to various technologies and comprehend use in bioengineering.
CO4: Develop and understanding of use of computation in modern biology

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	1	1	-	-	1	-	1	3	1
CO2	3	3	2	1	1	2	1	-	1	-	1	3	2
CO3	3	2	3	2	2	2	2	-	1	-	1	3	2
CO4	3	3	2	2	3	1	1	-	1	1	2	3	3

Contribution to SDGs
The course "Biology for Engineers" is most strongly aligned with **SDG 3 (Good Health and Well-being)**, **SDG 4 (Quality Education)**, **SDG 9 (Industry, Innovation and Infrastructure)**, and **SDG 12 (Responsible Consumption and Production)**. It develops foundational knowledge of biological systems, biomolecules, biomedical engineering, and bioinformatics while promoting innovation in healthcare technologies, sustainable bioprocesses, bio-based materials, and computational biology. The course also encourages interdisciplinary engineering solutions that contribute to improved healthcare, sustainable industrial practices, and responsible utilization of biological resources.

MEU-103-V1 ENGINEERING GRAPHICS AND 2D MODELLING

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		2	
L	**T**	**P**	**Total**
0	**0**	**4**	**4**

Sessional	**50 Marks**
Practical	**50 Marks**
Total	**100 Marks**
Duration of Exam	**3 Hours**

Pre- Requisite: Nil

Successive: Computer Aided Machine Drawing, Computer Aided Design and Analysis

Course Objectives

To develop students' ability to visualize, interpret, and communicate engineering concepts through graphical representation, understand principles of projections and sectioning of engineering objects, and apply CAD tools for creating and modifying technical drawings in accordance with engineering drawing standards.

Course Contents:

Unit 1:

Introduction: Importance, Significance and scope of Engineering Drawing, Usage of drawing Instruments, Dimensioning, Scales, Different types of projections, B.I.S Specifications.

Projection of Points and Lines: Introduction of plane of projection, reference & auxiliary planes, projection of points and line in different quadrants, traces, inclinations & true lengths of the lines, projections on auxiliary plane.

[**WK1, WK2, WK3, WK4, WK5, WK6, WK9**]

Unit 2:

Projection of Planes and Solids: Parallel to one reference plane, inclined to one plane but perpendicular to the other, inclined to both reference planes. Projection of Polyhedra, solids of revolution-in simple positions with axis perpendicular/inclined to a plane, with axis parallel/inclined to both planes.

Isometric & Orthographic Projections: Introduction, isometric scale, Isometric view of plane figures, prisms, pyramids and cylinders. Orthographic projections of simple engineering objects.

Sectioning of Solids and Development of Surfaces: Projections of sections of prisms, pyramids, cylinders and cones. Development of simple object with and without sectioning.

[**WK2, WK3, WK4, WK5, WK6, WK8**]

Unit 3:

Basics of CAD Software: CAD interface, Units & its modification, Sketcher workbench, Reference Planes, Snap to point, Grid, Specification Tree, Compass, Drawing points, lines, circle, rectangle, arcs, random profiles, spline etc. Using tools like Fit all In, Pan, Zoom in & Out, Normal View, Plane Rotate etc. Move, Copy, Mirror, Rotate, Array, Constraint, Auxiliary Point, Line & Plane, Fillet, Chamfer etc.

[**WK2, WK3, WK4, WK5, WK6, WK8**]

Unit 4:

Drawing 2D Sketches: Orthographic projections using CAD software; Related Problems on CAD softwar
[**WK2, WK3, WK4, WK5, WK6, WK8**]

Reference Books

1. Engineering Drawing by N. D. Bhatt. Charotar Publishing House.

2. Engineering Graphics and Design by P S Gill. S K Kataria & Sons.

3. Engineering Graphics & Design by Prof. Pradeep Jain (Hindi Language). Available at https://ekumbh.aicte-india.org/allbook.php

Recommended Books:

1. A Text Book of Engineering Drawing and Machine Drawing by M. L. Aggarwal and Sandhya Dixit. Dhanpat Rai & Co.
2. Engineering Drawing and Graphics using AutoCAD by T. Jeyapoovan. Vikas Publishing House.
3. Engineering Drawing with a Primer on Autocad by Arshad N. Siddique, Zahid A. Khan, Mukhtar Ahmad. Publisher: Prentice Hall India.

Web Links:

1. Engineering Drawing and Computer Graphics by NPTEL:

https://www.youtube.com/playlist?list=PLbRMhDVUMngel6OpnNppYzfJUQHSFePQb

Course Outcomes

At the successful completion of the course, the student shall have the ability to:

CO1: Apply engineering drawing standards and projection principles to represent geometric entities.

CO2: Generate orthographic, isometric, and projection views of planes and solids.

CO3: Construct sectional views and developments of engineering solids.

CO4: Prepare dimensioned 2D engineering drawings using CAD software

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	1	-	1	-	2	-	1	2	-
CO2	3	2	3	-	2	-	-	-	2	-	1	3	1
CO3	3	2	3	1	2	-	-	-	2	-	1	3	2
CO4	3	1	2	-	3	-	-	-	2	1	2	3	1

Contribution to SDGs:

The course Engineering Graphics and 2D Modelling is most strongly aligned with **SDG 4** (Quality Education) and **SDG 9** (Industry, Innovation and Infrastructure) because it develops the graphical communication, visualization, and CAD competencies that form the foundation of modern engineering design, manufacturing, and infrastructure development. It also indirectly supports **SDG 12** through accurate design documentation that reduces material wastage and production errors.

MEU-102-V1 WORKSHOP-II

B. Tech (Electronics & Computer Engineering) IInd Semester

No. of Credits		2	
L	**T**	**P**	**Total**
0	**0**	**4**	**4**

Sessional	**50 Marks**
Practical	**50 Marks**
Total	**100 Marks**
Duration of Exam	**3 Hours**

Pre- Requisite: Nil

Successive: Workshop- III, Workshop- IV, Workshop- V, Workshop- VI, Workshop- VII

Course Objectives:

To familiarize students with basic manufacturing processes, workshop tools, measuring instruments, and safe engineering practices through hands-on training in machine shop, fitting, sheet metal, carpentry, smithy, and welding operations.

MECHANICAL ENGINEERING WORKSHOP

List of Exercises:

Machine shop, fitting shop, sheet metal shop, carpentry, smithy & welding shop

Section (A): Machine Shop

1. To understand the layout, safety measures and fundamental concept of different engineering materials used in the workshop.
2. To study and demonstrate the various parts, specifications, accessories, attachments & operations on lathe, milling, shaping machine, drilling machine and various cutting fluids used during operations on conventional machine processes.
3. To study different types of digital and manual measuring tools used in metrology and determine the least count of vernier calipers, vernier height gauges and micrometers.

Section (B): Fitting & Sheet Metal Shop

4. To study different types of tools, equipment's, devices and machines used in fitting shop.
5. To prepare a job involving filing, drilling, tapping and hacksaw cutting operations on mild steel plate.
6. To study various types of sheet metal tools and prepare a simple sheet metal joint.

Section (C): Carpentry Shop and smithy shop

7. To study various types of carpentry tools and equipment's and timber used in carpentry section.
8. To prepare a simple wooden joint (cross lap / Tee-lap/dovetail joint) using kail wood in carpentry shop.
9. To study various types of forging / black smithy tools and prepare a ring or hook by hand forging operation.

Section (D): Welding Shop

10. To understand the layout, safety measures and fundamental concept of different tools and engineering materials used in welding workshop.
11. To understand and demonstrate the working principle of various welding machines namely, SMAW, TIG,

MIG/MAG, SAW, Oxy-Acetylene Gas welding & Resistance welding machines.

12. To prepare straight continuous bead & Butt Joint on given M.S plate in flat position by arc welding.

NOTE: - Total nine exercises should be performed from the above list. At least two from each section and remaining two may either be performed from above list or designed by the concerned institution as per the scope of the syllabus and facilities available.

References:

1. Workshop / Manufacturing Practices by Veeranna D. Kenchakkanavar (English/Hindi Edition). Published by: Khanna Book Publishing Co. (P) Ltd. Available at https://ekumbh.aicte-india.org/allbook.php

Course Outcomes (COs): After studying this course the students will be able to:

CO 1 Acquire skills on basic engineering materials and safety aspects.

CO 2 Understand the fundamental concept of various basic engineering practices namely fitting, sheet metal, carpentry and welding etc.

CO 3 Learn and use different marking & measuring instruments used in machine shop, fitting shop, sheet metal shop, carpentry & pattern making shop etc.

CO 4 Practice real time job preparation using various operations related to fitting, sheet metal, carpentry, welding etc.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	-	3	3	3	–	1	–	2	3	2
CO2	3	2	2	-	3	2	2	2	1	–	2	3	2
CO3	3	2	2	-	3	1	–	–	1	–	2	3	3
CO4	3	2	3	-	3	2	2	3	1	1	2	3	3

Contribution to SDGs:

The Mechanical Engineering Workshop course is most strongly aligned with:

- **SDG 4** (Quality Education) through experiential and skill-based learning.
- **SDG 8** (Decent Work and Economic Growth) by developing employable technical competencies.
- **SDG 9** (Industry, Innovation and Infrastructure) through exposure to manufacturing and fabrication technologies.
- **SDG 12** (Responsible Consumption and Production) by promoting precision, quality control, and efficient use of engineering materials.

Additionally, the strong emphasis on workshop safety makes the course significantly relevant to **SDG 3** (Good Health and Well-Being).

MTU-148-V1 MATHEMATICS-II

B. Tech (Electronics & Computer Engineering) IInd Semester

No. of Credits		4	
L	T	P	Total
3	1	0	4

Sessional	40 Marks
Theory	60 Marks
Total	100 Marks
Duration of Exam	3 Hours

Pre-requisites: Basic understanding of matrices, differential equations, partial differential equations, Laplace transforms, and basic calculus.

Course Objectives:

1. To develop understanding of matrices, eigenvalues, eigenvectors, and their engineering applications.
2. To solve ordinary differential equations arising in engineering problems.
3. To apply partial differential equations in heat flow and wave propagation.
4. To apply Laplace transforms for solving engineering differential equations.

MODULE-1: MATRICES AND ITS APPLICATIONS

Rank of a matrix, elementary transformations, elementary matrices, inverse using elementary transformations, normal form of a matrix, linear dependence and independence of vectors, Consistency of linear system of equations, linear and orthogonal transformations, eigenvalues and eigenvectors, properties of eigenvalues, Cayley- Hamilton theorem and its applications, diagonalization of matrices, similar matrices, quadratic forms.

WK1, WK2, WK3

MODULE 2: ORDINARY DIFFERENTIAL EQUATIONS AND APPLICATIONS

Exact differential equations, equations reducible to exact differential equations. Applications of differential equations of first order & first degree to simple electric circuits, Newton's law of cooling, heat flow and orthogonal trajectories, linear differential equations of second and higher order. Complete solution, complementary function and particular integral, method of variation of parameters to find particular integral, Cauchy's and Legendre's linear equations. Simultaneous linear equations with constant co-efficient. Applications of linear differential equations to simple pendulum, oscillatory electric circuits.

WK4, WK5, WK6

MODULE 3: PARTIAL DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS

Formation of partial differential equations, Lagrange' linear partial differential equation, first order non-linear partial differential equation, Charpit's method. Method of separation of variables and its applications to wave equation, one dimensional heat equation and two-dimensional heat flow (steady state solutions only).

WK7, WK8, WK9

MODULE 4: LAPLACE TRANSFORMS AND ITS APPLICATIONS

Laplace transforms of elementary functions. Properties of Laplace transforms, existence conditions, transforms of derivatives, transforms of integrals, multiplication by t^n, division by t. Evaluation of integrals by Laplace transforms. Laplace transform of unit step function, unit impulse function and periodic function. Inverse

transforms, convolution theorem, application to linear differential equations and simultaneous linear differential equations with constant coefficients.

WK10, WK11, WK12

REFERENCES:

1. Advanced Engineering Mathematics: E. Kreyszing; Wiley-India
2. Calculus and Analytic Geometry: G.B. Thomas, R.L. Finney; Narosa Publication
3. Higher Engineering Mathematics: B.S. Grewal; Khanna Publishers
4. Advanced Engineering Mathematics: Jain/Iyenger; Narosa Publication

Course Outcomes:

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

CO1 - Acquire knowledge of Matrix Algebra, Determinants and their applications in engineering subjects.

CO2 - Solve exact differential equations, equations reducible to exact form and linear differential equations of second and higher order with constant and variable coefficients

CO3 - Solve systems of simultaneous linear differential equations

CO4 - Solve problems based on electric circuits, heat flow, Newton's law of cooling and orthogonal trajectories

CO-PO Mapping

	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	1	-	1	-	-	-	1	-	1	3	1
CO2	3	3	2	2	1	-	-	-	1	-	1	3	2
CO3	3	3	3	2	2	-	1	-	1	-	1	3	2
CO4	3	3	2	2	3	-	-	-	1	-	1	3	2

Contribution to SDGs:

This course contributes to SDG 4 (Quality Education) by strengthening analytical and mathematical skills essential for engineering education. It supports SDG 7 (Affordable and Clean Energy) through applications in electrical circuits and energy systems, SDG 9 (Industry, Innovation and Infrastructure) through mathematical modelling and engineering analysis, SDG 11 (Sustainable Cities and Communities) through modelling of infrastructure and heat transfer systems, SDG 12 (Responsible Consumption and Production) by promoting optimization techniques, and SDG 13 (Climate Action) by enabling mathematical analysis of thermal and environmental systems.

ELU-151-V1 FUNDAMENTALS OF ELECTRICAL ENGINEERING

B. Tech (Electronics & Computer Engineering) IInd Semester

No. of Credits		3	
L	**T**	**P**	**Total**
3	**0**	**0**	**3**

Sessional	**40 Marks**
Theory	**60 Marks**
Total	**100 Marks**
Duration of Exam	**3 Hours**

Prerequisite: Mathematics and Physics at the senior secondary (10+2) level

Successive: Electrical Circuit Analysis, Electrical Machines, Renewable Energy Systems

Course Objectives (COs): The course aims to:

1. Develop a fundamental understanding of electrical circuit concepts, network theorems, and DC/AC circuit analysis.
2. Introduce the principles of single-phase and three-phase AC circuits, power measurement, and power factor concepts.
3. Explain the fundamentals of magnetic circuits, transformers, and their applications in electrical engineering.
4. Familiarize students with the construction, operating principles, and applications of electrical machines, along with an introduction to electric vehicle architecture and renewable energy technologies.

Unit 1: Introduction

Role and importance of circuits in engineering; concepts of fields, charge, current, voltage, and 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, and C** elements. Series and parallel circuits. Power and energy. Kirchhoff's Laws. Mesh and Nodal analysis, Delta-Star transformation. Superposition theorem. Thevenin's theorem. Norton's theorem. Maximum Power Transfer theorem. Tellegen's theorem.

[WK1, WK2, WK3, WK4]

Unit 2: Single-Phase AC Circuits

Single-phase EMF generation. Average and effective values of sinusoidal quantities. Complex representation of impedance. Series and parallel AC circuits. Concept of phasor and phasor diagrams. Power factor. Complex power. Real, reactive and apparent power. Resonance in series and parallel circuits. Q-factor. Bandwidth and their relationship. Half-power points.

Three-Phase AC Circuits: Three-phase EMF generation. Delta and star connections. Line and phase quantities. Solution of balanced three-phase circuits. Balanced supply and balanced load. Phasor diagrams. Three-phase power measurement using the two-wattmeter method.

[WK1, WK2, WK3, WK4, WK6]

Unit 3: 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. Principle of operation. Autotransformers and their applications.

[WK1, WK2, WK3, WK6, WK7]

Unit 4: Rotating Electrical Machines, Electric Vehicle Architecture, Renewable Energy Sources

Construction and working principles of: DC machines. Three-phase and single-phase Induction motor. Synchronous machines. Special Electrical Machines (BLDC and PMSM only)

Introduction to the basic architecture, components, and working principles of electric vehicles.

Introduction to renewable energy sources, their generation methods, and applications (Wind and Solar energy sources).

[WK1, WK2, WK3, WK6, WK7, WK8, WK9]

Course Outcomes

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

CO1. Understand the fundamental concepts of electrical quantities, circuit elements, sources, and DC network principles.
CO2. Apply electrical laws, network theorems, and phasor concepts to solve DC and AC circuit problems
CO3. Analyse magnetic circuits and transformers to determine their operating characteristics and performance.
CO4. Describe the operating principles and applications of electrical machines, electric vehicle architecture, and renewable energy systems.

References:

1. Basic Electrical Engineering, A. E. Fitzgerald, D. Higginbotham, and Arvin Grabel, Tata McGraw-Hill Publishing Company, 5th Edition.
2. Introduction to Electrical Engineering, Mulukutla S. Sarma, Oxford University Press.
3. Electrical and Electronic Technology, Edward Hughes, Pearson Education, 10th Edition.
4. Fundamentals of Electric Circuits, Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education.
5. Electric Machinery, A. E. Fitzgerald, Charles Kingsley Jr., and Stephen D. Umans, McGraw-Hill Education.
6. Basic Electrical Engineering, C. L. Wadhwa, New Age International (P) Ltd. Publishers.
7. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw-Hill, 2010.
8. Electrical Engineering Fundamentals, Vincent Del Toro, Prentice Hall of India.
9. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay, and Ali Emadi, CRC Press, New York, Washington, DC.

CO–PO Mapping Matrix

COs /POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	–	–	–	–	1	–	–	3	1
CO2	3	3	1	–	2	–	–	–	1	–	–	3	2
CO3	3	3	1	2	2	–	–	–	1	–	–	3	2
CO4	2	1	–	–	–	2	3	1	1	–	–	2	3

Contribution to SDGs:

The course primarily contributes to **SDG 4** (Quality Education) by developing a strong foundation in electrical engineering principles, circuit analysis, and problem-solving skills essential for engineering education. It supports **SDG 7** (Affordable and Clean Energy) by introducing students to energy-efficient electrical systems, transformers, renewable energy technologies, and the fundamentals of electric vehicles. The course also contributes to **SDG 9** (Industry, Innovation and Infrastructure) by building competencies required for modern electrical infrastructure and industrial applications, while promoting sustainable energy utilization and environmentally responsible engineering practices aligned with **SDG 11** (Sustainable Cities and Communities) and **SDG 13** (Climate Action) through the study of renewable energy systems and electric mobility technologies.

ELU-153-V1 FUNDAMENTALS OF ELECTRICAL ENGINEERING LAB

B. Tech (Electronics & Computer Engineering) IInd Semester

No. of Credits		1	
L	**T**	**P**	**Total**
0	**0**	**2**	**2**

Sessional	**25 Marks**
Practical	**25 Marks**
Total	**50 Marks**
Duration of Exam	**2 Hours**

Prerequisite: Familiarity with basic mathematical calculations and elementary electrical circuit analysis.

Successive: Electrical Circuit Analysis, Electrical Machines, Renewable Energy Systems

Lab Course Objectives: The course aims to:

1. Demonstrate safe work practices and use electrical measuring instruments for testing and analysis of basic electrical circuits.
2. Verify fundamental electrical circuit laws and network theorems through laboratory experiments.
3. Analyze the behavior of AC circuits, resonance, three-phase systems, and power measurements.
4. Conduct basic tests on transformers and analyze the construction and operational features of electrical machines.
5. Develop awareness of conventional and renewable energy systems through laboratory demonstrations and simulation-based activities.

List of Laboratory Experiments

1. To study electrical safety practices and the use of basic electrical measuring instruments.
2. To verify Ohm's Law and determine the equivalent resistance of series and parallel resistor networks.
3. To verify Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL).
4. To verify the Superposition, Thevenin's, Norton's, and Maximum Power Transfer Theorems using suitable electrical networks.
5. To obtain the frequency response characteristics and determine the resonance frequencies of series and parallel RLC circuits.
6. To measure real power, reactive power, apparent power, and power factor in a single-phase AC circuit.
7. To measure three-phase power and power factor in a balanced load using the two-wattmeter method.
8. To determine the polarity and transformation ratio of a single-phase transformer.
9. To study the constructional features and working principles of DC, three-phase induction, and synchronous machines.
10. To demonstrate the basic components and operation of Solar Photovoltaic (PV) Systems, Wind Energy Conversion Systems (WECS), and Electric Vehicle (EV) Systems.
11. To determine the phase sequence of a 3-phase supply and perform forward and reverse operation of a 3-phase induction motor using phase sequence reversal.
12. To plot the B-H hysteresis loop of a transformer core using CRO/DSO and determine its magnetic characteristics.

[WK2, WK3, WK5, WK7, WK8, WK9]

Course Outcomes:

After successful completion of the laboratory, the students will be able to:

CO1: Perform basic electrical measurements and experimentally verify fundamental circuit laws and network theorems in DC circuits. ((Bloom's Level: Apply – L3)
CO2: Analyze the performance of single-phase and three-phase AC circuits, resonance, and electrical power measurements through laboratory experiments. **(Bloom's Level: Analyze – L4)**
CO3: Conduct basic tests on transformers and identify the constructional features and operating principles of electrical machines. **(Bloom's Level: Apply – L3)**
CO4: Explain the fundamentals of conventional power generation, renewable energy systems, and electric vehicle technologies through laboratory demonstrations and simulation tools. **(Bloom's Level: Understand – L2)**

References/ Web Links for Virtual Labs and Simulation Software:
Virtual Labs | Electrical Engineering
https://asnm-iitkgp.vlabs.ac.in/ (Analog Signal, Network and Measurement Lab- IIT Kharagpur)
https://bes-iitr.vlabs.ac.in/ (Basic Electrical Science Lab -IIT Roorkee)
https://bee-iitk.vlabs.ac.in/ (Basic Electrical Engineering Lab – IIT Kanpur)
LTspice Simulation: LTspice | Analog Devices

CO–PO Mapping Matrix

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	2	2	–	1	1	1	–	1	3	2
CO2	3	3	2	2	2	1	–	1	1	–	1	3	2
CO3	3	2	2	2	2	1	1	1	1	–	1	3	2
CO4	2	1	1	1	2	2	2	1	1	–	2	2	3

Contribution to SDGs:

This course primarily contributes to **SDG 4 (Quality Education)** by providing hands-on learning experiences in electrical measurements, circuit analysis, transformers, and electrical machines, thereby strengthening practical engineering competencies. It supports **SDG 7 (Affordable and Clean Energy)** through laboratory exposure to energy-efficient electrical systems, transformers, renewable energy technologies, and electric vehicle systems. The laboratory also contributes **to SDG 9 (Industry, Innovation and Infrastructure)** by developing technical skills in modern electrical engineering practices and testing techniques, while promoting sustainable technologies and responsible engineering practices aligned with **SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action).**

CHU-141-V1 CHEMISTRY

B. Tech (Electronics & Computer Engineering) IInd Semester

No. of Credits		3	
L	T	P	Total
3	0	0	3

Sessional	40 Marks
Theory	60 Marks
Total	100 Marks
Duration of Exam	2 Hours

Course Objectives

1. To illustrate the basic understanding of Applied Chemistry and to improve the reasoning ability of the student towards Chemistry in everyday life, enhance the basic knowledge for the theoretical aspect of Engineering Chemistry.
2. To make students aware of the various applications of chemical sciences in engineering.
3. To analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
6. List major chemical reactions that are used in the synthesis of molecules.

Unit 1: Atomic and Molecular Structure

Postulates of quantum mechanics, solution of Schrodinger wave equation for Particle in one-dimensional box. Pi-molecular orbitals for ethylene, butadiene and benzene Crystal field theory and the energy level diagrams for transition metal complexes – tetrahedral and octahedral and their magnetic properties.

[WK1, WK2, WK3]

Unit 2: Spectroscopic Techniques and Their Applications

Electromagnetic spectrum, Types of energy transitions in atoms and molecules. UV–Visible Spectroscopy: Principle and Types of Electronic transitions, Chromophores and auxochromes, Bathochromic and hypsochromic shift, hyperchromic and hypochromic shift, Applications in qualitative and quantitative analysis**.**Infrared (IR) Spectroscopy: Principle of molecular vibrations, Stretching and bending vibrations, Functional group identification, Functional group region and fingerprint region, factor affecting stretching frequencies and Applications of IR spectroscopy.

[WK1, WK2, WK4, WK6]

Unit 3: Thermodynamics, Phase Equilibrium and Corrosion

Thermodynamic functions: Work, heat, entropy and free energy. Estimations of work done for reversible and irreversible processes: Isothermal and adiabatic.Phase, Component and Degree of Freedom, Gibbs Phase Rule, Phase diagram of One-Component System: Water and Carbon dioxide systems, Clausius–Clapeyron Equation, Corrosion: Types of corrosion and methods of prevention.

[WK1, WK2, WK6, WK7]

Unit 4: Stereochemistry and Organic Reactions

Structural isomers and stereoisomers, Representations of structures-Flying Wedge, Newman, Fischer and Saw Horse, configurations (absolute and relative) and. Chirality, enantiomers, diastereomers, optical activity, Principle of Polarimeter. Introduction to reactions involving substitution (SN1 and SN2), addition, elimination (E1, E2 and E1cb), oxidation (Bayer-Villiger and Oppenauer oxidation), reduction (Clemmensen and Birch reduction), Synthesis of commonly used drug molecules: Paracetamol, Aspirin and Chloroxylenol. **[WK1, WK2, WK3, WK6]**

References:

1. Organic Chemistry by Jonathan Clayden
2. Chemistry: Principles and Applications, by M. J. Sienko and A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition
7. Introduction to Spectroscopy by Donald L. Pavia, Gary M. Lampman, George S. Kriz, and James R. Vyvyan
8. "Organic Spectroscopy" by William Kemp
9. Concise Inorganic Chemistry by J.D. Lee
10. Engineering Chemistry-I Concepts and Applications by Jit Chakarborty, A.D. Gupta, R. Kamlekar

Course Outcomes:

The course will enable the students to:

CO1 Develop a strong foundation in the fundamental principles of chemistry relevant to engineering and technology applications.

CO2 Understand atomic and molecular structure, chemical bonding, intermolecular forces, and their role in material properties and engineering systems.

CO3 Apply concepts of thermodynamics, electrochemistry and corrosion in solving engineering problems and industrial applications.

CO4 Understand principles of spectroscopy, analytical chemistry, and instrumental techniques for characterization and analysis of chemical systems.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	–	1	–	–	–	1	–	1	3	1
CO2	3	3	2	1	2	1	1	–	1	–	1	3	2
CO3	3	2	2	1	2	1	–	–	1	–	1	3	2
CO4	3	3	2	2	2	1	2	–	1	–	1	3	2

Contribution to SDGs

This course contributes primarily to **SDG 4: Quality Education** by developing scientific knowledge, analytical thinking, and problem-solving skills in chemistry for engineering applications. It also supports **SDG 9: Industry, Innovation and Infrastructure** through the study of materials, spectroscopy, thermodynamics, corrosion prevention, and chemical processes that underpin technological advancement. Furthermore, the course contributes to **SDG 12: Responsible Consumption and Production** by promoting sustainable chemical practices, efficient resource utilization, and green chemistry principles. The emphasis on corrosion control, environmental protection, and sustainable chemical technologies also supports **SDG 13: Climate Action**, enabling learners to develop environmentally responsible and sustainable engineering solutions.

CHU-142-V1 CHEMISTRY LAB.

B. Tech (Electronics & Computer Engineering) IInd Semester

No. of Credits		1	
L	**T**	**P**	**Total**
0	**0**	**2**	**2**

Sessional	**25 Marks**
Practical	**25 Marks**
Total	**50 Marks**
Duration of Exam	**2 Hours**

Course Objectives:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Choice of 8–10 Experiments from the followings:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry – determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Models of Potential Energy Surfaces
13. Chemical Oscillations – Iodine Clock Reaction
14. Determination of Partition Coefficient of a substance between two immiscible liquids
15. Polarimeter – To determine specific optical rotation of given compound
16. Adsorption of acetic acid by charcoal

[WK1, WK2, WK3, WK4, WK6]

References:

1. Engineering Practical Chemistry by B. Sethi, B. Mangla & R. Sachdeva (Manakin Press)
2. Chemistry: Principles and Applications, by M. J. Sienko and A. Plane
3. Engineering Practical Chemistryby M. R. Senapati (Laxmi Publications)
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

5. Practical Chemistry for Engineering Students by H. A. James

Laboratory Course Outcomes

1. The course will enable the students to:
2. **CO1:** Perform fundamental chemistry experiments using standard laboratory techniques to determine the physical and chemical properties of materials and solutions.
3. **CO2:** Apply analytical and instrumental methods such as chromatography, conductometry, potentiometry, polarimetry, and ion-exchange techniques for qualitative and quantitative chemical analysis.
4. **CO3:** Conduct experiments related to reaction kinetics, colligative properties, adsorption, polymer/drug synthesis, and electrochemical processes, and interpret the experimental results using scientific principles.
5. **CO4:** Demonstrate safe laboratory practices, accurate data analysis, and effective reporting while recognizing the role of chemistry in sustainable engineering, water quality assessment, and materials development.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	–	2	–	–	–	1	–	1	3	1
CO2	3	3	2	1	2	1	1	–	1	–	1	3	2
CO3	3	2	2	2	2	1	–	–	1	–	1	3	2
CO4	3	2	2	2	2	1	2	–	1	–	1	3	2

Contribution to SDGs:

This laboratory course contributes primarily to **SDG 4: Quality Education** by providing practical knowledge of chemical principles, analytical techniques, and scientific experimentation. It also supports **SDG 9: Industry, Innovation and Infrastructure** through hands-on training in modern laboratory methods, material characterization, and chemical analysis. Furthermore, the course contributes **to SDG 6: Clean Water and Sanitation** by developing skills in water quality analysis and treatment techniques, and **SDG 12: Responsible Consumption and Production** by promoting safe laboratory practices, efficient use of chemicals, and sustainable experimentation. The emphasis on environmentally responsible laboratory practices and chemical process optimization also supports **SDG 13: Climate Action**.

ENG-101-V1 ENGLISH

B. Tech (Electronics & Computer Engineering) IInd Semester

No. of Credits		2	
L	T	P	Total
2	0	0	2

Sessional	40 Marks
Theory	60 Marks
Total	100 Marks
Duration:	3 Hours

Pre-requisites: There are no formal prerequisites for this course.

Course Objectives

1. To introduce the students to the basics of English.

2. To familiarize students with active reading strategies and hone their textual comprehension skills.

3. To equip students with basic writing skills.

4. To build communicative confidence and interpersonal fluency through targeted language lab exercises.

Unit 1: Basics of English

Root words: Prefixes and suffixes, synonyms and antonyms, homonyms and homophones, idioms and phrases, one-word substitution, Review of basic grammar rules, common grammatical errors, sentence structures and error spotting, contextual clues and their use.

[WK1, WK7, WK9]

Unit 2: Reading Skills

Reading Comprehension for vocabulary building, identifying main ideas, supporting details, drawing inferences, reading exercises for understanding different text types: articles, stories, reports, and emails, reading strategies: skimming, scanning, and close reading

[WK1, WK7, WK8]

Unit 3: Writing Skills

Writing exercises for sentence and paragraph construction, Grammar review and practice, writing different types of texts: emails, letters, paragraphs and essays, Process writing, Precis writing, Exercises in Creative writing (Poem/Story/Impression).

[WK3, WK7, WK9]

Unit 4: Communication Exercises (This unit involves interactive practice sessions in Language Lab)

Exercises on Listening, Impromptu Speeches, Storytelling, Role-Playing, and Pronunciation drills, "Just-a-Minute" Speeches, Conversations and Dialogues, Group Discussions and Presentations. Team building exercises, Interviews.

[WK6, WK7, WK9]

Reference Books

1. Blum, M. Rosen. How to Build Better Vocabulary. Bloomsbury.

2. Comfort, Jeremy et al. Speaking Effectively. Cambridge University Press.

3. English Grammar and Competition – S.C. Gupta.

4. Remedial English Grammar – F.T. Wood.

5. On Writing Well – William Zinsser.

6. Selected short stories by Gogol, Tolstoy, Melville, Poe and Tagore.

Course Outcomes

At the successful completion of the course, the student shall have the ability to:

CO1: Understand the basics of English language and grammar.

CO2: Analyze and interpret different reading materials using reading strategies.

CO3: Develop structured academic and professional writing skills.

CO4: Communicate confidently through presentations, discussions and interviews.

CO–PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	1	-	-	-	1	-	1	3	1
CO2	3	3	2	1	2	1	-	-	1	-	1	3	2
CO3	3	2	2	1	1	2	-	-	1	-	1	3	2
CO4	3	2	1	1	2	1	-	-	1	-	1	3	1

Contribution to SDGs

This course contributes to **SDG 4 (Quality Education)**, **SDG 8 (Decent Work and Economic Growth)**, **SDG 10 (Reduced Inequalities)**, and **SDG 16 (Peace, Justice and Strong Institutions)** by strengthening communication, critical thinking, inclusivity, and professional skills.

MEU-101-V1 WORKSHOP-I

B. Tech (Electronics & Computer Engineering) I[st] Semester

No. of Credits		2	
L	**T**	**P**	**Total**
0	**0**	**4**	**4**

Sessional	**50 Marks**
Practical	**50 Marks**
Total	**100 Marks**
Duration of Exam	**3 Hours**

Pre- Requisite: Nil

Successive: Workshop- III, Workshop- IV, Workshop- V, Workshop- VI, Workshop- VII

PART-A
Computer Engineering Workshop

1. To study and demonstrate the block diagram of a digital computer system and explanation of each unit.
2. To study and demonstrate internal parts of a Computer System (Card level) and other peripheral devices and explanation of POST & BIOS.
3. To study and demonstrate primary memory and secondary memory.
4. To demonstrate Mother Board/ Main Board and its parts, Chipset, Connectors, Add-on Card
5. To study various processors (Pentium-I, II, III, DUAL Core, i-3, i-5, i-7, etc.).
6. To study various types of monitors: LCD /LED/TFT/PLASMA DISPLAY & New Technologies.
7. To study different printer types and their working.
8. Assembly / Installation and Maintenance of Personnel Computer Systems: Practical exercise on assembly of Personnel Computer System, Installation of Operating System: Windows; Linux etc., Installation of other Application Software's and Utility Software's, Fault finding in Personnel Computers: Software or Hardware wise, Virus: Introduction, its Types & Removal techniques, Data Backup and Restore, Data Recovery Concepts, Typical causes of Data loss.
9. Introduction to computer networking concepts: Introduction of connecting devices: Hub, Switch & Router, etc., Networking Cable preparation: Normal & Cross Cables, Data Transferring Techniques from one Computer System to another Computer System, Configuration of Switch/ Routers, etc.
10. Introduction to system security and network security.

[WK2, WK3, WK4, WK6]

PART-B

Electrical Workshop

1. Introduction to Electrical Safety and precautions, Electrical Symbols, Electrical Materials, abbreviations commonly used in Electrical Engineering and familiarization with tools used in Electrical Works.
2. Demonstration and familiarization of domestic and industrial accessories, i.e., MCBs, ELCBs, three-phase main switches, selector switch, contactor, different types and use of Earthing and fuses.
3. To know about electrical AC and DC systems, single- and three-phase systems & measurements of electrical parameters.

Any four from Sr. No. 4 to 9

4. Prepare and test an extension board and draw a schematic and wiring diagram and connection method in a three-pin power plug.
5. To install and check the function of an IoT-based smart power strip.
6. To know how to draw different types of domestic and industrial wiring, staircase or Go- down wiring.
7. To draw, wire up and test the schematic and wiring diagram for controlling one lamp by fan regulator and study the effect of increasing and decreasing luminous intensity of the lamp.
8. Familiarization and circuit study of Electrical equipment, i.e., Electric Iron, Electric Toaster, Electric heater, Air coolers and fans, etc.
9. To know how the working of Digital and Analog multimeters, clamp meter, earth tester, continuity tester high precision table top multimeters, etc.

[WK1, WK3, WK6, WK7]

PART- C

Electronics Workshop

1. To study and demonstrate basic electronic components: diode, transistor, resistance, inductor, and capacitor.
2. To study and demonstrate resistance color coding, measurement using color code and multimeter and error calculation considering tolerance of resistance.
3. To study and demonstrate multimeter and CRO- front panel controls, description of the block diagram of the CRT and the block diagram of the CRO.
4. To study and demonstrate Vp (peak voltage), Vpp (peak to peak voltage), Time, frequency and phase using CRO.

5. Introduction to function generator. Functions of front panel controls and measurement of different functions on CRO.
6. To study and demonstrate a variable DC regulated power supply, function of controls and DC measurement using multimeter and CRO.
7. Soldering practice on wire mesh or a resistance decade board includes fabrication, soldering, lacing, harnessing, forming and observation.
8. Testing of components using multimeter and CRO like diode, transistor, resistance, capacitor, Zener diode and LED.
9. To study and demonstrate rectification, half wave, Full wave and bridge rectifier. Fabrication, assembly and wave form observation.
10. To design and fabricate a printed circuit board of a Zener regulated/ series regulated power supply and various measurements, testing of power supply.

[WK1, WK3, WK4, WK6]

Note: At least 8 exercises are to be performed from each part by the students.

Course Outcomes:

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

CO1. Identify, assemble, configure, and troubleshoot computer hardware, operating systems, and basic computer networks.

CO2. Apply safe engineering practices while working with electrical tools, components, domestic wiring, and electrical installations.

CO3. Perform measurements, testing, fabrication, and troubleshooting of basic electronic circuits using appropriate electronic instruments.

CO4. Demonstrate multidisciplinary workshop skills in computer, electrical, and electronics engineering for practical problem-solving, maintenance, and industrial applications.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	1	1	-	-	1	-	1	3	1
CO2	3	3	2	1	1	2	1	-	1	-	1	3	2
CO3	3	2	3	2	2	2	2	-	1	-	1	3	2
CO4	3	3	2	2	3	1	1	-	1	1	2	3	3

Contribution to SDGs:

This workshop course contributes primarily to **SDG 4**: Quality Education by developing practical skills in computer, electrical, and electronics engineering through hands-on learning and experimentation. It also supports **SDG 8**: Decent Work and Economic Growth by building industry-relevant technical competencies in installation, maintenance, troubleshooting, networking, and electrical safety. Furthermore, the course contributes to **SDG 9**: Industry, Innovation and Infrastructure through exposure to modern computing systems, networking technologies, IoT applications, PCB fabrication, and electronic circuit design. The emphasis on maintenance, repair, efficient utilization of resources, and safe engineering practices also supports **SDG 12**: Responsible Consumption and Production and **SDG 3**: Good Health and Well-being by promoting sustainable engineering practices and workplace safety. Additionally, the strong emphasis on workshop safety makes the course significantly relevant to **SDG 3** (Good Health and Well-Being)

VALUE ADDED COURSES

VAC-112-V1 CONSTITUTION OF INDIA

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		1	
L	T	P	Total
-	-	2	2

Sessional	25 Marks
Practical	-
Total	25 Marks

Pre- Requisite: Nil

Course Objectives

The objective of this course is to familiarize students with the philosophy, historical evolution, and salient features of the Constitution of India, enabling them to understand the principles that govern the nation's democratic framework. The course aims to develop awareness of Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, the structure and functioning of the government, constitutional amendments, emergency provisions, and local self-governance. It also seeks to cultivate constitutional values, ethical responsibility, and responsible citizenship by promoting an understanding of justice, equality, liberty, fraternity, and the rule of law, thereby preparing students to contribute effectively to society and uphold the ideals enshrined in the Constitution.

Unit 1: Introduction to the Constitution of India

Meaning of Constitution and Constitutionalism, Historical perspective of the Constitution of India, Salient features and characteristics of the Constitution of India.

[WK1, WK7, WK8, WK9]

Unit 2: Fundamental Rights, Duties and Directive Principles

Scheme of the Fundamental Rights, Scheme of the Fundamental Duties and their legal status; Directive Principles of State Policy (DPSPs): Importance and implementation.

[WK7, WK9]

Unit 3: Structure of Government and Constitutional Framework

Federal structure and distribution of legislative and financial powers, Parliamentary form of Government in India, Constitutional powers and status of the President of India.

[WK7, WK9]

Unit 4: Constitutional Amendments, Governance and Fundamental Rights

Constitutional amendment: Powers and procedure, Historical perspective of constitutional amendments, Emergency provisions: National Emergency, President's Rule and Financial Emergency, Local Self Government: Constitutional scheme in India. Fundamental Right to Equality, Fundamental Right to Freedom under Article 19, Right to Life and Personal Liberty under Article 21, Role of constitutional values in democracy, justice, equality and responsible citizenship. **[WK7, WK8, WK9]**

Reference Books:

1. The Constitutional Law of India 9th Edition, by Pandey. J. N.
2. The Constitution of India by P. M. Bakshi
3. Constitutional Law of India by Narender Kumar
4. Bare Act by P. M. Bakshi

Course Outcomes

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

CO1: Explain the historical evolution, philosophy, and salient features of the Constitution of India.

CO2: Interpret the Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, and the structure of Indian governance.

CO3: Analyze the constitutional framework relating to federalism, parliamentary democracy, constitutional amendments, and emergency provisions.

CO4: Apply constitutional values, legal principles, and civic responsibilities in professional practice and public life.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1	–	–	–	2	2	3	2	–	2	1	–
CO2	1	2	–	–	–	2	2	3	2	1	2	1	–
CO3	2	2	1	1	–	2	2	3	2	1	2	1	1
CO4	1	2	1	–	–	2	3	3	2	2	2	1	1

Contribution to SDGs

This course contributes primarily to **SDG 4: Quality Education** by enhancing constitutional literacy, civic awareness, ethical reasoning, and responsible citizenship. It also supports **SDG 10**: Reduced Inequalities by promoting equality, justice, and the protection of fundamental rights guaranteed by the Constitution of India. Furthermore, the course contributes to **SDG 16:** Peace, Justice and Strong Institutions by fostering an understanding of democratic governance, the rule of law, constitutional values, and institutional accountability. The emphasis on citizen participation, constitutional duties, and inclusive governance also supports **SDG 17: Partnerships for the Goals**, encouraging collaborative efforts towards nation-building and sustainable development.

VAC-105-V1 UNIVERSAL HUMAN VALUES

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		1	
L	**T**	**P**	**Total**
-	**-**	**2**	**2**

Sessional	**25 Marks**
Practical	**-**
Total	**25 Marks**

Course Objectives:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act

Human Values Course

This course also discusses their role in their family. It, very briefly, touches issues related to their role in society and the nature, which needs to be discussed at length in one more semester, for which the foundation course named as "H-102 Universal Human Values 2: Understanding Harmony" is designed, which may be covered in their III or IV semester. During the Induction Program, students' world gets and initial exposure to human values through Universal Human Values –I. This exposure is to be augmented by this compulsory full semester foundation course.

Unit-1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

[WK7, WK8, WK9]

Unit-2: Understanding Harmony in The Human Being - Harmony in Myself!

1. Understanding the human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss a program for ensuring health vs dealing with disease.

[WK7, WK8, WK9]

Unit-3: Understanding Harmony in the Family and Society- Harmony in Human – Human Relationship

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2. Understanding the meaning of Trust; Difference between intention and competence
3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
5. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

[WK7, WK8, WK9]

Unit-4: Understanding Harmony in Nature and Existence - Whole Existence as Coexistence

1. Understanding the harmony in nature
2. Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self-regulation in nature
3. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human beings as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

[WK1, WK7, WK8, WK9]

Unit-:5 Implications of the Above Holistic Understanding of Harmony on Professional Ethics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for the above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order: a. At the level of the individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
7. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist, etc.

[WK7, WK8, WK9]

References:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Course Outcomes

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

CO1 Develop self-awareness and understand harmony within oneself through self-exploration and right understanding.

CO2 Demonstrate harmonious relationships in family and society based on universal human values and ethical behaviour.

CO3 Understand the interconnectedness of nature and existence, and apply sustainable practices in personal and professional life.

CO4 Apply human values and professional ethics in engineering practice for responsible, sustainable, and socially beneficial development.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	–	–	–	–	2	2	3	2	–	3	1	–
CO2	1	1	–	–	–	2	2	3	3	1	2	1	1
CO3	1	2	–	1	–	2	3	2	2	–	2	1	1
CO4	2	2	1	1	–	2	3	3	2	2	2	2	1

Contribution to SDGs

This course contributes primarily to **SDG 4: Quality Education** by fostering value-based education, ethical reasoning, self-awareness, and lifelong learning. It also supports **SDG 3: Good Health and Well-being** by promoting mental well-being, self-discipline, and harmonious living. Furthermore, the course contributes to **SDG 11: Sustainable Cities and Communities** and **SDG 12: Responsible Consumption and Production** by encouraging responsible citizenship, sustainable lifestyles, and social harmony. The emphasis on environmental responsibility, ethical decision-making, and professional conduct also supports **SDG 13: Climate Action** and **SDG 16: Peace, Justice and Strong Institutions**, enabling learners to contribute towards an inclusive, peaceful, and sustainable society.

AEC-106-V1 MESSAGE OF BHAGAVAD GITA

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		1	
L	**T**	**P**	**Total**
-	**-**	**2**	**2**

Sessional	**25 Marks**
Practical	**-**
Total	**25 Marks**

Course Objectives:

To enable the students to create an awareness on Message of Bhagwat Gita to instill Moral, Social Values and to appreciate Karma Yoga.

Unit-1: Introduction

Relevance of Bhagavad Gita today- Background of Mahabharatha, Spiritual Background of Srimad Bhagvad Geeta, Arjuna Vishada Yoga: Arjuna's Anguish and Confusion- Symbolism of Arjuna's Chariot. Sankhya Yoga: Sankhya perspective, Qualities of Soul, Swadharm perspective, Yoga perspective, Qualities of a Sthita-prajna

[WK7, WK8, WK9]

Unit-2: Karma Yoga and Dhyana Yoga

Meaning of Karma Yoga, Sakam Karma, Nishkam Karma, Means of Meditation, Qualities of a Dhyan Yogi, Methods for controlling the mind

[WK7, WK8, WK9]

Unit-3: Bhakti Yoga

Nature of the Supreme and his realization, Types of Devotion, Sakam Bhakti, Nishkam Bhakti, Universal Form of God, Sagun Devotion, Nirgun Devotion, Inner Qualities of a True Devotee.

[WK7, WK8, WK9]

Unit-4: Gunatraya Vibhaga Yoga

Dynamics of the Three Gunas: Tamas, Rajas, Sattva- Going Beyond the Three Gunas- Description of A Gunatheetha.

[WK7, WK8, WK9]

References:

1. Dr. Satyavrat Vidyaalankar, "Srimad Bhagvad Geeta", 2021
2. Swami Chinmayananda: "The Holy Geeta", Central Chinmaya Mission Trust, 2002.
3. Swami Chinmayananda, "A Manual of Self Unfordment", Central Chinmaya Mission Trust, 2001.

Course Outcomes:

Upon completion of the course, the student should be able to:

CO1 Interpret the concepts of the soul (*Atman*), *Swadharma*, *Sthita-prajna*, and the symbolism presented in the *Bhagavad Gita*, and relate them to ethical decision-making and personal development and apply the principles of *Karma Yoga* to promote responsible conduct and professional ethics.

CO2 Demonstrate an understanding of the principles of *Dhyana Yoga* and *Bhakti Yoga*, including meditation techniques, mind control, forms of devotion, and the qualities of an ideal devotee, for enhancing self-discipline and emotional well-being.

CO3 Analyze the characteristics and influence of the three *Gunas* (*Sattva*, *Rajas*, and *Tamas*) and evaluate their role in shaping human behavior, personality, and spiritual growth.

CO4 Evaluate the teachings of the *Bhagavad Gita* as a guide for value-based living, leadership, ethical decision-making, and holistic personality development in contemporary life.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	1	–	–	–	2	2	3	2	–	3	1	–
CO2	1	1	–	–	–	2	2	3	2	1	3	1	–
CO3	1	2	–	1	–	2	2	3	2	–	2	1	1
CO4	2	2	1	1	–	2	3	3	2	2	2	2	1

Contribution to SDGs:

This course contributes primarily to **SDG 4: Quality Education** by fostering ethical reasoning, value-based learning, self-awareness, and lifelong personal development. It also supports SDG 3: Good Health and Well-being by promoting mental well-being, emotional balance, self-discipline, and meditation practices. Furthermore, the course contributes to **SDG 16: Peace, Justice and Strong Institutions** by encouraging ethical leadership, responsible decision-making, integrity, and respect for universal human values. The emphasis on selfless action, compassion, social harmony, and collective responsibility also supports **SDG 17: Partnerships for the Goals**, inspiring collaborative efforts for sustainable and inclusive societal development.

VAC-115-V1 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

B. Tech (Electronics & Computer Engineering) Ist Semester

No. of Credits		1	
L	**T**	**P**	**Total**
-	-	2	2

Sessional	**25 Marks**
Practical	**-**
Total	**25 Marks**

Pre-requisites: There are no formal prerequisites for this course.

Course Objectives

1. Understand the fundamentals of Indian Knowledge Systems and traditional wisdom.
2. Explain the significance of ancient Indian scriptures and philosophical traditions.
3. Correlate modern science with Indian Knowledge Systems.
4. Understand Yoga, Ayurveda and holistic healthcare.

Unit 1: Introduction of Traditional Knowledge

Indian traditional knowledge of social, science, medicines, warfare, judiciary, etc.

[WK1, WK7]

Unit 2: Ancient Indian Scriptures

Veda--- Meaning, Types of Vedas-- Rig-Veda, Sama-Veda, Yajur-Veda, and Atharva-Veda,

Upveda---Meaning, types of upveda, Description of each upveda;

Vedang--- Meaning, no. of Vedang, Description of each Vedang;

Updesha: Dharmshastra, Mimamsa, Puran, Tarkshastra, Important scriptures of other religions

[WK1, WK8]

Unit 3: Modern Science and Indian Knowledge System

Various fields of Indian knowledge; Communication, Mathematics, Phonetics, Metaphysics and Philosophy, Life Sciences, Medical Sciences, Cosmology, Military Science etc.

[WK2, WK3, WK4]

Unit 4: Yoga and Holistic Health Care

Introduction, Yogic Concepts of Wellbeing, Relationship between Health and Disease, Maintain wellbeing, Ayurveda.

Case study of development of an Ayurveda treatment centre; Patanjali; Development of Yoga as World Yoga Divas; any other case study related to Indian traditions.

[WK4, WK6,WK7]

Reference Books:

1. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya,Vidya Bhavan, Mumbai.
2. Swami Jitatman and, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Swami Jitatman and, Holistic Science and Vedant, Bharatiya Vidya Bhavan
4. Fritzof Capra, Tao of Physics
5. Fritzof Capra, The Wave of life VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Arnakulam Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata
6. GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya,
7. Vidyanidhi Prakashan, Delhi RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi
8. Prakashan, Delhi P B Sharma (English translation), Shodashang Hridayan
9. Pedagogy: Problem based learning, group discussions, collaborative mini projects. Outcome: Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

Course Outcomes

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

CO1: Explain the evolution, significance, and multidisciplinary nature of the Indian Knowledge System, including its contributions to society, science, medicine, governance, and culture.

CO2: Describe the structure and significance of the Vedas, Upvedas, Vedangas, and other Indian scriptures, and appreciate their role in preserving knowledge and ethical values.

CO3: Analyze the contributions of the Indian Knowledge System to modern disciplines such as mathematics, communication, philosophy, life sciences, medical sciences, cosmology, and military science, and relate them to contemporary developments.

CO4: Demonstrate an understanding of the principles of Yoga, Ayurveda, and holistic healthcare, and evaluate case studies highlighting the application of Indian traditional knowledge in promoting sustainable development, health, and societal well-being.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	1	-	-	-	1	-	1	3	1
CO2	3	3	2	1	1	-	-	-	1	-	1	3	2
CO3	3	2	2	1	2	1	-	-	1	-	1	3	2
CO4	3	2	1	1	2	1	1	-	1	-	1	3	2

Contribution to SDGs

This course contributes to the following Sustainable Development Goals (SDGs): SDG 3 – Good Health and Well-being: Promotes Yoga, Ayurveda and holistic healthcare for physical and mental well-being. SDG 4 – Quality Education: Enhances awareness of Indian Knowledge Systems, traditional wisdom and lifelong learning. SDG 11 – Sustainable Cities and Communities: Encourages preservation of cultural heritage and sustainable traditional practices. SDG 16 – Peace, Justice and Strong Institutions: Develops ethical values, harmony and responsible citizenship through Indian philosophical traditions.

DISCIPLINE SPECIFIC COURSES

EEU-101-V1 FUNDAMENTALS OF ELECTRONICS ENGINEERING

B. Tech (Electronics & Computer Engineering) IInd Semester

No. of Credits		3	
L	**T**	**P**	**Total**
3	**0**	**0**	**3**

Sessional	**40 Marks**
Theory	**60 Marks**
Total	**100 Marks**
Duration of Exam	**3 Hours**

Successive: Analog Electronic Circuits, Measurements and Communication Systems

Course Objectives

The following are the course objectives:

1. To comprehend the physical operation, electrical characteristics, and practical circuit applications of foundational semiconductor devices, including diodes and regulators.
2. To develop a technical understanding of BJT and FET configurations, enabling the analysis of electronic circuits used for amplification and switching.
3. To acquire hands-on proficiency in using standard testing equipment, selecting industrial sensors, and implementing basic signal conditioning techniques.
4. To gain a foundational overview of signal modulation, wireless networks, and the architectural elements that drive modern telecommunication platforms.

Unit-I: Semiconductor Devices and Electronic Components

Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical diodes, diode equivalent circuits, Zener diode breakdown mechanism (Zener and avalanche).

Diode Application: Diode configuration, half and full wave rectification, clippers, clampers, Zener diode as shunt regulator, voltage-multiplier circuits.

Special Purpose Two Terminal Devices: Light-emitting diodes, photo diodes, varactor diodes, tunnel diodes.

(WK1, WK2, WK3, WK4)

Unit-II: Transistors and Electronic Circuits

Bipolar Junction Transistor: Transistor construction, operation, amplification action. Common Base, Common Emitter, Common Collector configurations with working and characteristics.

Field Effect Transistor: Construction and characteristics of JFETs, transfer characteristics. MOSFET (MOS) (Depletion and Enhancement) type, transfer characteristics.

(WK2, WK3, WK4, WK5)

Unit-III: Electronic Measurements, Sensors and Instrumentation

Electronic Measurements and Sensors: Introduction to Electronic Measurements, Measurement of Voltage, Current and Resistance, Accuracy and Precision.

Introduction to Sensors and Transducers: Active and Passive Sensors, Characteristics of Sensors, Basic Working and Applications of Temperature Sensors (RTD, Thermistor and Thermocouple), Light Sensors (LDR and Photodiode), and Proximity Sensors.

Electronic Instruments: Digital Multimeter (DMM)- Construction, Functions and Applications. CRO/DSO- Basic Block Diagram, Front Panel Controls, Measurement of Voltage, Time Period and Frequency. Function Generator- Generation of Sine, Square and Triangular Waveforms.

Signal Conditioning and Data Acquisition: Need for Signal Conditioning, Basic Signal Conditioning Operations (Amplification and Filtering), Introduction to Data Acquisition Systems and Applications.

(WK3, WK4, WK5, WK6, WK7)

Unit-IV: Fundamentals of Communication Engineering

Basics of signal representation and analysis, electromagnetic spectrum, elements of a communication system, need for modulation, typical applications, fundamentals of amplitude modulation and demodulation.

Introduction to wireless communication, cellular communication, fundamentals of satellite & radar communication.

(WK4, WK5, WK6, WK7)

Text Books

1. Thomas L. Floyd, Electronic Devices, Pearson Education.
2. R. L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson Education.
3. A.P. Godse and U.A. Bakshi, Basic Electronics Engineering, Technical Publications.

Reference Books

1. S. Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits, McGraw Hill.
2. Raj Kamal, Embedded Systems: Architecture, Programming and Design, McGraw Hill.
3. Arshdeep Bahga and Vijay Madisetti, Internet of Things: A Hands-on Approach, Universities Press.
4. H.S. Kalsi, Electronic Instrumentation, McGraw Hill.

Course Outcomes (COs)

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

CO1: Explain the fundamental operating principles, construction, and characteristics of semiconductor devices, transistors, engineering sensors, and electronic communication frameworks

CO2: Use standard laboratory instruments—including DMMs, CROs, and function generators—to measure electrical quantities and implement foundational signal conditioning operations

CO3: Analyze the behavior and performance of basic electronic circuits, including multi-configuration transistor networks, rectifiers, voltage regulators, wave-shaping configurations, and modulated signals

CO4: Select appropriate semiconductor components, sensor technologies, and communication architectures to meet specific technical requirements for engineering applications

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	2	1	-	-	-	2	-	-	3	2
CO2	3	3	2	1	2	-	-	-	2	-	-	3	2
CO3	3	2	2	2	3	1	-	-	2	-	-	3	2
CO4	3	2	2	2	2	2	1	-	2	-	-	3	3

Contribution to SDGs:

The Fundamentals of Electronics Engineering course aligns with SDG 4 (Quality Education) and SDG 9 (Industry, Innovation, and Infrastructure) by providing foundational skills in semiconductor networks, diagnostic instrumentation, and wireless communications. It directly supports SDG 7 (Affordable and Clean Energy)by focusing on low-power MOSFET configurations, efficient rectification, and Zener voltage regulation to optimize energy consumption. Furthermore, the curriculum reinforces SDG 11 (Sustainable Cities and Communities) through the study of smart sensor interfaces and data acquisition frameworks essential for intelligent urban automation. This training ultimately advances SDG 12 (Responsible Consumption and Production) by ensuring engineers design durable, long-lasting electronic circuits that actively minimize hardware failure and global electronic waste.

EEU-103-V1 PYTHON LAB FOR ELECTRONICS ENGINEERING

B. Tech (Electronics & Computer Engineering) IInd Semester

No. of Credits		1	
L	**T**	**P**	**Total**
0	**0**	**2**	**2**

Sessional	**25 Marks**
Practical	**25 Marks**
Total	**50 Marks**
Duration of Exam	**2 Hours**

Pre- Requisite: Nil

Successive: Robotics and Artificial Intelligence

Course Objective:

This laboratory course introduces Electronics Engineering students to Python programming with emphasis on engineering applications. Students learn programming fundamentals, numerical computation, data visualization, engineering calculations, scientific computing, and simulation techniques commonly used in Electronics Engineering analysis and design.

Course Outcomes:

At the successful completion of the course, the student shall have the ability to:

CO 1 Develop Python programs using fundamental programming constructs.

CO 2 Apply numerical methods and mathematical libraries for engineering calculations.

CO 3 Analyze and visualize engineering data using scientific computing tools.

CO 4 Solve basic electronics engineering problems using Python-based simulations and computational techniques.

List of Experiments:

1. Introduction to Python: Variables, Data Types, Input-Output Operations.
2. Python Programs using Arithmetic, Relational and Logical Operators.
3. Decision-Making Programs using if, if-else, and nested if statements.
4. Iterative Programs using for and while loops.
5. Programs using Functions and Modular Programming.
6. String Manipulation and Python Data Structures (List, Tuple, Set, and Dictionary) for Engineering Applications.
7. Introduction to NumPy Arrays, Matrix Operations, and Vectorized Computation.
8. Solution of Simultaneous Linear Equations and Linear Algebra Applications using NumPy.
9. Data Handling, Cleaning, and Analysis using Pandas DataFrames.

10. Statistical Analysis of Experimental Data using Pandas and NumPy (Mean, Median, Variance, Standard Deviation).
11. Scientific Computing using SciPy: Numerical Integration, Differentiation, and Root Finding.
12. Plotting Basic Graphs and Engineering Data Visualization using Matplotlib.
13. Write a Python program to calculate the equivalent resistance, capacitance, and inductance for components connected in series and parallel.
14. Write a Python program to implement Ohm's Law and calculate electrical power and energy consumption.
15. Write a Python program to perform conversions between Binary, Decimal, Octal, and Hexadecimal number systems.
16. Write a Python program to generate the truth tables of basic logic gates (AND, OR, NOT, NAND, NOR, XOR, and XNOR).
17. Write a Python program to calculate the frequency, time period, wavelength, and resonant frequency of an LC circuit.
18. Write a Python program to create reusable functions for common electronics calculations such as Ohm's Law, Power, Resistance, Capacitance, and Inductance.
19. Write a Python program to develop a menu-driven Electronics Utility that performs number system conversions, logic gate operations, and basic electronics calculations.

WK Mapping:

- **In experiments 1–6** , focus on computational thinking, algorithm development, programming logic, and software implementation. These experiments map to **WK2, WK3, WK6, and WK8**.
- **In experiments 7–10**, students apply numerical methods, matrix operations, statistics, and data analysis techniques using modern computational tools. These experiments map to **WK2, WK3, WK4, WK6, and WK8**.
- **In experiments 11–14**, the emphasis is on numerical modeling, engineering data interpretation, visualization, and computational problem-solving. These experiments map to **WK2, WK3, WK4, WK5, WK6, and WK8**.
- **In experiments 15–19**, students apply Python to model and simulate real electronic and logic systems, integrating engineering fundamentals, specialized electronics knowledge, design considerations, computational tools, and analytical reasoning. These experiments map to **WK2, WK3, WK4, WK5, WK6, and WK8**.

Reference Books:

1. Introduction to Python for Science & Engineering by David J. Pine. CRC Press.
2. Python Programming by Dr. Rupesh Nasre (in English and Hindi Language). Available at https://ekumbh.aicte-india.org/allbook.php

Web links:

1. https://nptel.ac.in/courses/106106182 (The joy of computing using Python)
2. https://nptel.ac.in/courses/106106212 (Python for Data Science)
3. https://nptel.ac.in/courses/106107220 (Data Analytics with Python)
4. https://nptel.ac.in/courses/115104095 (Computational Science and Engineering Using Python)

Contribution to SDGs:

This course contributes primarily to SDG 4 (Quality Education) by developing programming, computational thinking, and digital skills essential for modern engineering education. It also supports SDG 8 (Decent Work and Economic Growth) through industry-relevant Python and data analysis competencies, SDG 9 (Industry, Innovation and Infrastructure) by enabling computational modeling, simulation, and engineering problem-solving, and SDG 12 (Responsible Consumption and Production) through data-driven analysis for efficient resource utilization and optimized engineering designs.