JOY UNIVERSITY

Established vide Tamil Nadu State Pvt. Universities Act 2019

SCHOOL OF COMPUTATIONAL INTELLIGENCE

Outcome Based Curriculum Framework with

CBCS

for

BACHELOR OF TECHNOLOGY (ECE - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

(B. Tech. ECE AI & ML)

Students admitted from 2025 -26 onwards

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semper paratus

VISION

♣ To create and nurture a multidisciplinary global university with highest academics, research and ethical standards in a creative and innovative environment.

MISSION

♣ To be a premier University of choice for all stakeholders and contribute for academic demographic dividend. To inculcate quality, integrity, team work, compassion, ethics in new generation students for catering to various needs of society.

QUALITY OBJECTIVES

- To disseminate knowledge with skills through teaching, training, seminars, workshops, conferences and symposia in Engineering and Technology, Art and Design, Management and Commerce, Allied Health Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences, Law and Agricultural Sciences to enable students to meet the current needs and trends of industries, business and society.
- To provide technical and scientific solutions to real time problems posed by industries, business and society in all Schools of Joy University.
- To inculcate quality, integrity, team work, compassion, ethics in new generation students for catering to various needs of society.

- To promote the spirit of entrepreneurship in the young generation to help and create more career opportunities in the society by incubating a nurturing technology product idea backed by Technology Business Incubation.
- To identify and nurture leadership and innovate skills in students to become future leaders to enrich society.
- To develop collaborations and partnerships with International global and reputed Universities, research establishments, Government and NGO's, industries and businesses. To support both faculties and students for international exposure.

SCHOOL OF COMPUTATIONAL INTELLIGENCE

VISION

The SOCI envisions a 'cooperatively competitive' academic environment in the thematic areas of the school and relevant research backed by quality education to churn out graduates with professional acumen, exceptional leadership and a humane heart to meet both national and global needs.

MISSION

The SOCI offers a value-based, technology-oriented education striving to achieve high levels of academic excellence, intellectually competence and exemplary values. The tri-value system of our school is designed to deliver education through three interconnected values: **Learning, Transmutation** and **Transformation**.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1: To ensure that the graduates will have the ability and attitude to acquire new skills and adapt recent technological changes.

PEO 2: To prepare the graduates to serve in the industries related to Electronics and Communication with Artificial Intelligence and Machine Learning (ECE- AI & ML) or to do higher education and research.

PEO 3: To ensure that the graduates will work with professionalism and ethics by contributing to the advancement of the society.

GRADUATE ATTRIBUTES

The Graduate Attributes of B. Tech ECE (AI and ML) are:

Apply appropriate knowledge in the field of *ECE (AI and ML)* to identify, formulate, analyze, and solve complex engineering problems in order to reach substantive conclusions.

- Self-learn and engage in use of advanced computing tools related to *ECE (AI and ML)*.

- Develop sustainable computing solutions in broader economic, societal and environmental contexts.
- Think critically, creatively and analytically as a AI scientist, whilst being able to work effectively, independently and collaboratively as part of a team in research, technology development and entrepreneurial ventures.
- Apply evolving ethics and privacy laws across various domains and territories.
- Effectively communicate engineering concepts and ideas to peers in written or oral forms.
- Be motivated to engage in independent and life-long learning in the broadest context of evolving technological challenges.

PROGRAMME OUTCOMES

On completion of the **B. Tech ECE (AI & ML) Programme,** students should be able to:

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

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO 1: Design and build ECE with AI & ML systems for various applications using analytical, logical and problem-solving skills.

PSO 2: Develop AI-powered software systems to activate, control and operate AI based ECE systems.

PSO 3: Apply AI and ML concepts in the department of ECE to solve real-world problems in a variety of domains including industrial, communication, healthcare, military, etc.

Acronyms	Abbreviations
PCT	Program Core Theory
PCL	Program Core Lab
IDC	Inter-Disciplinary Course
IDL	Inter-Disciplinary Lab
VAC	Value Added Course
PSE	Programme Specific Elective

Acronyms	Abbreviations
GE	Generic Elective
L	Lecture
T	Tutorial
P	Practical
N	NPTEL
C	Credit
TCH	Total Contact Hour

Summary of Credits

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	21	20	21	24	22	24	23	174
Contact Hrs./ Week	26	24	24	24	27	26	24	15	190

SEMESTER WISE CREDIT STRUCTURE

Sl. No.	Category of Courses	1st Year		2ndYear		3rd Year		4h Year		Total
		Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Sem VII	Sem VIII	
1	Departmental Core	12	13	18	15	15	14	13	8	108
2	Departmental Electives				3	3	3	3	3	15
3	Allied Schools Electives (Open Electives)					3	3	3		9
4	Applied Sciences	7	7							14
5	Seminar/ Internships / Field Visits/ Independent Study/ Mini projec						1		2	3
6	Mini project /major Project						1	5	10	16
7	Extra Academic Activity/ value added		1	2	3	3				9
8	Humanities/ Recent Trends									
	Total Credits	19	21	20	21	24	22	24	23	174

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School of Computational Science

B. Tech. (ECE with Artificial Intelligence and Machine Learning)
Semester – I
(Total Credits: 19)

SI. No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
1	25AEEN811	**Ability Enhancement Compulsory Course (AECC)** Effective Communication	3	0	0	3	3
2	25BTEA111	**Core Course / Major** Fundamentals of Computing	3	0	0	3	3
3	25BTEA112	**Core Course / Major** Basic Electrical & Electronics Engineering	3	0	0	3	3
4	25BTEA113	**Core Course/ Allied** Mathematics I (Calculus and Linear Algebra)	3	1	0	4	4
5	25BTEA114	**Core Course/ Applied Science** Engineering Physics I	3	1	0	4	3
6	25BTEA911	**Value-Added Course** Performing Arts/Sports (Non-Graded) (NSS/NCC/Yoga/ Sports)	3	0	0	3	1
7	**Laboratory**						
8	25BTEA211	**Core Course / Major** Fundamentals of Computing Lab	0	0	2	2	1

SI. No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
9	25BTEA212	**Core Course / Major** Basic Electrical & Electronics Engineering Lab	0	0	2	2	1
	Total		**18**	**2**	**4**	**24**	**19**

Semester – II
(Total Credits: 21)

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
1	25BTEA121	**Core Course / Major** Programming for Problem Solving with Python	3	0	0	3	3
2	25BTEA122	**Core Course / Major** Probability, Statistics and Stochastic Processes	3	0	0	3	3
3	25BTEA123	**Core Course/ Allied** Mathematics II	3	1	0	4	4
4	25BTEA124	**Core Course/ Applied Science** Engineering Physics II	3	0	0	3	3
5	25BTEA125	**Core Course/ Applied Science** Network Analysis	3	0	0	3	3
6	25EVST921	**Value Added Course** Environmental Science	2	0	0	2	2
	Laboratory						
7	25BTEA221	**Core Course / Major** Programming for Problem Solving with Python Lab	0	0	2	2	1

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
8	25BTEA222	**Core Course / Applied Science** Engineering Physics II Lab	0	0	2	2	1
9	25BTEA223	**Skill Enhancement Course** Extended Reality and its Applications (from TANSAM)	0	0	2	2	1
	Total		**17**	**1**	**6**	**24**	**21**

Semester – III
(Total Credits: 20)

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
1	25BTEA131	**Core Course** Artificial Intelligence-(Machine Learning Fundamentals)	3	0	0	3	3
2	25BTEA132	**Core Course** Signals and Systems	3	0	0	3	3
3	25BTEA133	**Core Course** Digital Design	3	0	0	3	3
4	25BTEA133	**Core Course** Electronic Devices & Circuits	3	0	0	3	3
6	25BTEA134	**Core Course** Object-Oriented Programming	3	0	0	3	3
7	25BTEA931	**Value Added Course** Professional Ethics	2	0	0	2	2

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
	Laboratory						
8	25BTEA211	**Core Course** Electronic Devices & Circuits Lab	0	0	2	2	1
9	25BTEA212	**Core Course** Digital Design lab	0	0	2	2	1
10	25BTEA213	**Core Course** OOP Lab	0	0	2	2	1
11	25BTEA932	**Value Added Course** Constitution of India / Universal Human Values	1	0	0	1	0
		Total	**18**	**0**	**6**	**24**	**20**

Semester – IV
(Total Credits: 21)

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
1	25BTEA131	**Core Course** Deep Learning	3	0	0	3	3
2	25BTEA132	**Core Course** Analog Communication Systems	3	0	0	3	3
3	25BTEA134	**Core Course** Microprocessors and Microcontrollers	3	0	0	3	3
4	25BTEA135	**Core Course** Networks and Transmission Lines	3	0	0	3	3

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
5		**Discipline Specific Elective I**	3	0	0	3	3
6	24BTEA941	**Skill Enhancement Course** Engineering Economics and	3	0	0	3	3
	Laboratory						
7	25BTEA241	**Core Course** Communication Systems Lab	0	0	2	2	1
8	25BTEA242	**Core Course** Microcontroller Lab	0	0	2	2	1
9	25BTEA243	**Core Course** Deep Learning Lab	0	0	2	2	1
	Total		**18**	**0**	**6**	**24**	**21**

Discipline Specific Electives (DSE) (ECE and AI/ML Domain) (IV sem)

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
1	25BTEA041	Reinforcement Learning	3	0	0	3	3
2	25BTEA042	Explainable AI	3	0	0	3	3
3	25BTEA043	AI in Healthcare	3	0	0	3	3
4	25BTEA044	Microwave Engineering	3	0	0	3	3

Discipline Specific Electives (DSE) (ECE and AI/ML Domain) (IV sem)							
SI.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs / Wk**	**Credits**
5	25BTEA045	Smart Antennas	3	0	0	3	3
6	25BTEA046	Cognitive Radio and AI-Enabled Wireless Networks	3	0	0	3	3

Semester – V

(Total Credits: 24)

Sl.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
1	25BTEA151	**Core Course** Digital Signal Processing	3	0	0	3	3
2	25BTEA152	**Core Course** VLSI Design	3	0	0	3	3
3	25BTEA153	**Core Course** Digital Communication	3	0	0	3	3
4	25BTEA154	**Core Course** Operating Systems	3	0	0	3	3
5		**Discipline Specific Elective II** (AI or ECE Domain)	3	0	0	3	3
6	25BTEA951	**Skill Enhancement Course** Principles of Management	3	0	0	3	3
7		**Open Elective – I**	3	0	0	3	3
	Laboratory						
8	25BTEA251	**Core Course** DSP Lab	0	0	2	2	1
9	25BTEA252	**Core Course** Digital Communication Lab	0	0	2	2	1
10	25BTEA253	**Core Course** VLSI Lab	0	0	2	2	1
	Total		**21**	**0**	**6**	**27**	**24**

Discipline Specific Electives (DSE) I(ECE and AI/ML Domain) (V Sem)							
SI.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs / Wk**	**Credits**
1	25BTEA051	Federated Learning	3	0	0	3	3
2	25BTEA052	Pattern Recognition	3	0	0	3	3
3	25BTEA053	Edge AI and TinyML	3	0	0	3	3
4	25BTEA054	MIMO Systems and Deep Learning	3	0	0	3	3
5	25BTEA055	AI for Network Security and Intrusion Detection	3	0	0	3	3
6	25BTEA056	SDN and NFV with Machine Learning	3	0	0	3	3

Semester – VI

(Total Credits: 22)

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
1	25BTEA161	**Core Course** Embedded Systems & IoT	3	0	0	3	3
2	25BTEA162	**Core Course** Computer Vision	3	0	0	3	3
3	25BTEA163	**Core Course** Wireless & Mobile Communication	3	0	0	3	3
4	25BTEA164	**Core Course** Natural Language Processing	3	0	0	3	3
5		**Discipline Specific Elective III** (AI or ECE Domain)	3	0	0	3	3
6		**Open Elective – II**	3	0	0	3	3
	Laboratory						
7	25BTEA261	**Core Course** Embedded/IoT Lab	0	0	2	2	1
8	25BTEA262	**Core Course** Computer Vision (CV)	0	0	2	2	1
10		Industry Project / Internship	0	0	2	2	1
11		Seminar / Presentation Skills	0	0	2	2	1
	Total		**18**	**0**	**8**	**26**	**22**

Discipline Specific Electives (DSE) (ECE and AI/ML Domain) (VI Sem)							
Sl.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs / Wk**	**Credits**
1	25BTEA061	AI for Signal and Image Processing	3	0	0	3	3
2	25BTEA062	Neural Network Hardware Acceleration	3	0	0	3	3
3	25BTEA063	AI in Wireless Communication	3	0	0	3	3
4	25BTEA064	AI in Optical and Satellite Communication	3	0	0	3	3
5	25BTEA065	EDA Tools and ML for VLSI Optimization	3	0	0	3	3
6	25BTEA066	Hardware-Software Co-design with AI	3	0	0	3	3

Semester – VII

(Total Credits: 24)

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
1	25BTEA171	**Core Course** 5G Communication & AI Applications	3	0	0	3	3
2	25BTEA172	**Core Course** Ethics, Policy, Law and Standards in AI	3	0	0	3	3
3	25BTEA173	**Core Course** GANs (Generative Adversarial Networks)	3	0	0	3	3
4	25BTEA174	**Core Course** AI Chips and Neuromorphic Computing	3	0	0	3	3
5		Discipline Specific Elective IV (AI or ECE Domain)	3	0	0	3	3
6		**Open Elective – III**	3	0	0	3	3
	Laboratory						
7	25BTEA271	**Core Course** Generative Adversarial Networks (GANs) Lab	0	0	2	2	1
8	25BTEA272	Research Methodology / Design Thinking	2	0	0	2	0
9	25BTEA273	**Core Course** Major Project Phase I	0	0	2	2	5
	Total		**20**	**0**	**4**	**24**	**24**

Discipline Specific Electives (DSE) (ECE and AI/ML Domain) (VII Sem)							
SI.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs / Wk**	**Credits**
	25BTEA071	AI for Robotics and Control Systems	3	0	0	3	3
	25BTEA072	Neuro-Symbolic AI	3	0	0	3	3
	25BTEA073	AI for VLSI Design & Verification	3	0	0	3	3
	25BTEA074	Advanced Digital Signal Processing with AI	3	0	0	3	3
	25BTEA075	Speech and Audio Processing using Deep Learning	3	0	0	3	3
	25BTEA076	Biomedical Image Analysis using CNNs	3	0	0	3	3

Semester – VIII

(Total Credits: 23)

SI.No	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Credits
1	25BTEA181	**Core Course** ASIC Design	3	0	0	3	3
2	25BTEA182	**Core Course** AI for Society / Innovation and Entrepreneurship	3	0	0	3	3
3		Discipline Specific Elective V (AI or ECE Domain)	3	0	0	3	3
	Laboratory						
4	25BTEA281	**Core Course** ASIC Design Lab	0	0	2	2	2
5	25BTEA282	**Core Course** Capstone Project (Major Project Phase II)	0	0	2	2	10
6	25BTEA283	Viva Voce / Seminar / Paper Publication	0	0	2	2	2
	Total		**9**	**0**	**6**	**15**	**23**

Discipline Specific Electives (DSE) (ECE and AI/ML Domain) (VIII Sem)							
SI.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs / Wk**	**Credits**
1	25BTEA081	Federated Learning and Privacy-Preserving AI	3	0	0	3	3
2	25BTEA082	AI for Embedded Systems	3	0	0	3	3
3	25BTEA083	AI in Biomedical Signal Processing	3	0	0	3	3
4	25BTEA084	AI in Video and Image Compression	3	0	0	3	3
5	25BTEA085	Intelligent Control Systems	3	0	0	3	3
6	25BTEA086	Deep Learning for Autonomous Vehicles	3	0	0	3	3

Interdisciplinary Courses							
SI.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs / Wk**	**Credits**
1		Robotics and Control	3	0	0	3	3
2		AI in Finance / Agriculture	3	0	0	3	3
3		Human-AI Interaction	3	0	0	3	3

Interdisciplinary Courses							
SI.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs / Wk**	**Credits**
4		AI in Industrial Automation and Robotics	3	0	0	3	3
5		Swarm Intelligence and Distributed AI Systems	3	0	0	3	3

Open Electives							
SI.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs / Wk**	**Credits**
1	25BTEA931	Professional Ethics	3	0	0	3	3
2	25BTEA932	Indian Constitution	3	0	0	3	3
3	25BTEA933	Engineering Economics and Foreign Trade	3	0	0	3	3
4	25BTEA934	Principles of Management	3	0	0	3	3
5	25BTEA935	Solar Power and Applications	3	0	0	3	3
6	25BTEA936	(Humanities/ Entrepreneurship)	3	0	0	3	3

SEMESTER I

Programme	**B.Tech ECE (AI&ML)**	**Programme Code**	**BTEA**
Course	**25BTEA 111**	**Number of Hours/Week**	**3**
Semester	**I**	**Max. Marks**	**100**
Year	**I**	**Credits**	**4**

Core Course				
Course Title	**FUNDAMENTALS OF COMPUTING**	**L**	**T**	**P**
		3	**0**	**0**

L-Lecture Hours	**T-Tutorial Hours**	**P-Practical Hours**

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- To have a comprehensive understanding of a foundational understanding of computer systems.
- To learn about various number systems including decimal, binary, octal, and hexadecimal
- To develop a comprehensive grasp of how computers function, the types of software used and the significance of networking in today's digital world.
- To explore various types of software applications including operating systems,

UNIT	TOPI	HOURS
I	**Introduction to Computer** Evolution of Computers, Generations of Computers, Classification of Computers, The Computer System, Computing Concepts, Applications of Computers. **Memory and storage systems** Computer Software and Hardware components and its requirements- Storage Devices, **Computer Viruses** Types Of Viruses – Spreading of Virus, Prevention of Computer Virus, Virus Detection, Computer Security, Maintenance, Desktop functions, Dialog boxes, Single Document Interface (SDI), Multiple Document Interface (MDI), Windows Controls, Main Menu Display, Categories of Menus, Main and Context Sensitive	**12**

II	**Microsoft software** MS DOS, MS Word System, MS Excel System, MS Power point System, MS Access System, MS Publisher. **Number System** Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, BCD, XS,3, Gray Code, Alphanumeric Codes,(ASCII, EBCDIC).	**12**
III	**Computer Software** Machine language, Mnemonics, High level Language, Assembler, Compiler, Interpreter, System Development Programs, System Management Programs , Standard Application Programs , Unique Application Programs, Problem Solving, Structuring the Logic	**12**

IV	**Memory management** Introduction, History, Functions, Process, Memory File, Management Device, Security Management, Types of Operating Systems, Providing User Interface, Popular Operating Systems.	**12**
V	**THE INTERNET AND WORLD WIDE WEB** History of the Internet-The Internet Applications-Understanding World Wide Web-Web Browsers-Browsing the Internet-Using a Search Engine- Email Service-Protocols used in the Internet. **DATA COMMUNICATIONS AND NETWORKS** Introduction-Data Communication Using Modem-Computer Networks- Network Topologies-Network Protocols and Software-Applications of Network.	**12**

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Understand the basic concepts of computers.

CO2: Analyze the basics of number systems.

CO3: Apply system development programs to create and manage simple software projects.

CO4: Analyze the performance of different memory management techniques and their impact on system efficiency.

CO5: Evaluate the knowledge of Internet history to understand current Internet technologiesand to solve problems in communication and information access.

Text Books:

1. Fundamentals of Computers, E.Balagurusamy, Tata McGraw Hill Education Private Limited, 2009.

Reference Books:

1. Introduction to Computer Fundamentals, Bright Siaw Afriyie, Second edition, Trafford Publishing,Canada, 2003-2006.
2. Computer Fundamentals, P. K. Sinha, BPB Publications, Sixth Edition, 2004.
3. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley publishers,Nineth edition, 2013.
4. Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Fifth edition, Prentice Hall, 2011.
5. Computing Fundamentals: Introduction to Computers, Faithe Wempen, Wiley 2014.

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	0	1	1	0	0	0	2	0	0	0	1	3	2	0	0
CO	3	3	0	2	3	0	0	0	0	0	1	3	2	0	0
CO	3	3	3	2	2	0	0	0	0	0	3	3	2	1	1
CO	2	3	1	3	2	0	0	0	0	0	1	3	2	1	1
CO	3	3	2	3	3	0	0	0	0	0	1	3	2	1	1

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B.Tech ECE (AI&ML)**	**Programme Code**	**BTEA**
Course Code	**25BTEA211**	**Number of Hours/Week**	**2**
Semester	**I**	**Max. Marks**	**100**
Year	**I**	**Credits**	

Core Course				
Course Title	**FUNDAMENTALS OF COMPUTING LAB**	**L**	**T**	**P**
		0	**0**	**2**

L-Lecture Hours	**T-Tutorial Hours**	**P-Practical Hours**

LIST OF PROGRAMS

1. Basics of Microsoft Word.
2. Insert Table and Generating Chart.
3. Mail Merging.
4. Study on features of Microsoft Excel.
5. Incorporating the predefined functions in Excel.
6. Inserting table and generating chart in Excel.
7. Pivot chart, table and slicing in Excel.
8. Study on features in Microsoft PowerPoint.
9. Creating presentation incorporating the features of PowerPoint.
10. Study on HTML.
11. Basic web page design, formatting, inclusion of image and video.
12. Creation of Table.
13. Designing own web page.

On successful completion of this course, the student will be able to

CO1: Understand the basic functionalities of Microsoft Word

CO2: Apply advanced Excel features for data management.

CO3: Create complex data presentations using Excel pivot tables, charts, and slicers.

CO4: Develop professional presentations using advanced PowerPoint features.

CO5: Design and develop basic web pages using HTML

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	0	1	1	0	0	0	2	0	0	0	1	3	2	0	0
CO	3	3	0	2	3	0	0	0	0	0	1	3	2	0	0
CO	3	3	3	2	2	0	0	0	0	0	3	3	2	1	1
CO	2	3	1	3	2	0	0	0	0	0	1	3	2	1	1
CO	3	3	2	3	3	0	0	0	0	0	1	3	2	1	1

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B.TECH . ECE (AI & ML)**	**Programme Code**	**BTEA**
Course Code	**25BTAI112**	**Number of Hours/Week**	**3**
Semester	**I**	**Max. Marks**	**100**
Year	**I**	**Credits**	**3**

Core course

Course Title	**Basic Electrical and Electronics Engineering**	**L**	**T**	**P**
		3	**0**	**0**

COURSE OBJECTIVES:

The main aim of this course is to prepare the students for:

To introduce the fundamental concepts of electrical circuits and systems
To impart knowledge on the construction, operation, and applications of electrical machines
To familiarize students with electrical installations and safety practices
To develop an understanding of semiconductor devices and analog electronic circuits
To introduce the principles of digital electronics and their real-world applications

UNIT	**TOPICS**	**HOURS**
I	Fundamentals of Electrical Circuits: Introduction to Electrical Engineering-Electric current, voltage, power, and energy- Ohm's Law and Kirchhoff's Laws- Series and parallel circuits-Star-delta transformations-Introduction to AC and DC circuits-Sinusoidal waveforms: RMS, average value, form factor-Phasor representation, impedance, power factor-Real, reactive, and apparent power	**12**

II	**Electrical Machines** Magnetic circuits and electromagnetic induction- Transformers: construction, working principle, EMF equation, efficiency- DC machines: construction, working, characteristics of motors and generators- Single-phase induction motors: types and applications -Three-phase induction motors: principle, types, applications- Basics of synchronous machines	**12**
III	**Electrical Installations and Safety** Components of LT switchgear: MCB, ELCB, MCCB, fuses- Domestic wiring types and estimation- Earthing and grounding systems- Safety precautions and protection devices- Energy meter (single phase and three phase)- Electrical energy consumption calculation	**12**
IV	**Electronic Devices and Circuits** Semiconductors: intrinsic and extrinsic- Diodes: PN junction, Zener diode, applications (rectifiers, voltage regulation)- Bipolar Junction Transistor (BJT): operation, configurations, applications- Field Effect Transistor (FET): operation and applications- Introduction to optoelectronic devices: LED, photodiode	**12**
V	**Digital Electronics and Applications** Number systems: binary, decimal, octal, hexadecimal- Boolean algebra and logic gates- Combinational circuits: adders, subtractors, multiplexers,- demultiplexers- Sequential circuits: flip-flops, counters, shift registers- Introduction to microprocessors and microcontrollers (basics only)- Applications of electronics in home appliances and communication	**12**

Andragogy

Class Room Lectures, Power point presentation, You Tube, Group Discussion, Seminar, Quiz,Formative Assessments, Brain storming, Activity

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Understand and apply basic laws and theorems of electrical circuits

CO2: Explain the construction, working, and applications of electrical machines

CO3: Demonstrate knowledge of electrical wiring, energy consumption, and safety procedures

CO4: Analyze the behavior of semiconductor devices in analog circuits

CO5: Apply the fundamentals of digital electronics for logical operations and circuit design

Text Book:

1. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education.
2. 2. M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press

Reference Books:

1. David V. Kerns, J. David Irwin, Electrical and Electronics Engineering for Scientists and Engineers, Pearson Education, 1st Edition, 1999.
2. V.K. Mehta and Rohit Mehta , Principles of Electrical Engineering and Electronics, S. Chand Publishing, Revised Edition, **2019**

Mapping of CO's with PO's and PSO's (Articulation Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	0	1	1	0	0	0	2	0	0	0	1	3	2	0	0
CO2	3	3	1	2	3	0	0	0	0	0	1	3	2	0	0
CO3	3	3	3	2	2	0	0	0	0	0	3	3	2	1	1
CO4	2	3	2	3	2	0	0	0	0	0	1	3	2	1	1
C05	3	3	3	3	3	0	0	0	0	0	1	3	2	1	1

3 – high, 2 – Average, 1 - low , 0-null

Programme	**B.Tech ECE (AI&ML)**	**Programme Code**	**BTEA**		
Course Code	**25BTEA212**	**Number of Hours/Week**	**2**		
Semester	**I**	**Max. Marks**	**100**		
Year	**I**	**Credits**			
Core Course					
Course Title	**BASIC ELECTRICAL AND ELECTRONICS LAB**		**L**	**T**	**P**
			0	**0**	**2**
L-Lecture Hours	**T-Tutorial Hours**	**P-Practical Hours**			

Electrical Experiments

1. **Verification of Ohm's Law and Kirchhoff's Laws**
    - Measure voltage and current in resistive circuits and verify KVL and KCL.
2. **Measurement of Power in a Single-Phase Circuit**
    - Using wattmeter and voltmeter-ammeter method in RLC circuits.
3. **Resonance in RLC Series and Parallel Circuits**
    - Study resonance condition and observe bandwidth and quality factor.
4. **Load Test on Single-Phase Transformer**
    - Determine efficiency and voltage regulation.
5. **Open Circuit and Short Circuit Test on Transformer**
    - Derive equivalent circuit parameters and efficiency.
6. **Measurement of Power in Three-Phase Circuit Using Two-Wattmeter Method**
    - Observe power factor and active/reactive power.
7. **Speed Control of DC Shunt Motor**
    - Using field and armature control methods.
8. **Three-Phase Induction Motor Characteristics**
    - Measure torque-speed characteristics under different loads.

Electronics Experiments

9. **V-I Characteristics of PN Junction Diode**
    - Forward and reverse bias characteristics.
10. **Zener Diode Characteristics and Voltage Regulation**

- Analyze breakdown region and regulation performance.

11. **Half-Wave and Full-Wave Rectifier with and without Filters**

- Observe waveform, ripple factor, and average voltage.

12. **Input and Output Characteristics of BJT in CE Configuration**

- Determine current gain (β) and plot characteristic curves.

13. **BJT Amplifier in Common Emitter Mode**

On successful completion of this course, the student will be able to

CO1: Apply the knowledge of mathematics, science, and engineering fundamentals to model and solve electrical and electronic circuit problems.

CO2: Identify, formulate, and analyze electrical and electronic circuits using first principles and suitable analytical techniques.

CO3: Design circuits for rectifiers, amplifiers, logic gates, and combinational logic circuits with consideration for performance and accuracy.

CO4: Use appropriate techniques, tools, and resources to perform measurements, analyze data, and interpret outcomes in electrical and electronics experiments.

CO5: Apply software tools (e.g., simulation tools like Multisim, LTSpice) for the design, simulation, and analysis of basic electrical and electronic circuits

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	0	1	1	0	0	0	2	0	0	0	1	3	2	0	0
CO	3	3	0	2	3	0	0	0	0	0	1	3	2	1	1
CO	3	3	3	2	3	0	0	0	0	0	3	3	3	1	1
CO	2	2	1	2	2	0	0	0	0	0	1	2	2	1	1
CO	3	3	2	3	3	0	0	0	0	0	1	3	3	1	1

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B. Tech ECE -AI&ML**	**Programme Code**	**BTEA**
Course Code	**25BTEA113**	**Number of Hours/Week**	**4**
Semester	**I**	**Max. Marks**	**100**
Year	**I**	**Credits**	**4**

Applied Science Course

Course Title	**MATHEMATICS-I**	**L**	**T**	**P**
		3	**1**	**0**

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- To recall and remember basics of matrices, complex numbers, and differential calculus.
- To understand the concepts of basic mathematical methods for matrices, complex numbers and differential calculus.
- To apply methods to solve engineering problems.
- To analyze engineering problems and evaluate.
- To solve and evaluate the problems using matrices, complex numbers, and

UNIT	**TOPI**	**HOURS**
I	**Introduction to Differentiation and its applications:** Fundamentals of Differentiation, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders, Indeterminate forms and	**10**
II	**Integration and its applications:** Double integral, Triple integral, Change of order of integration, Change of variables, Beta and Gamma functions and their properties, Dirichlet's integral and its applications to area and volume, Liouville's extensions of Dirichlet's integral.	**12**
III	**Sequence:** Real number system, Convergence of sequence and series, Tests for convergence	**8**
IV	**Series:** Power series, Taylor's series, Series for exponential, trigonometric and logarithm functions, Fourier series: Half range sine and cosine series, Parseval's theorem.	**8**
V	**Advanced Multivariable Calculus:** Limit, continuity and partial derivatives, Directional derivatives, Total derivative, Tangent plane and normal line, Maxima, minima and saddle points, Method of Lagrange multipliers, Gradient,curl and	**10**

VI	**Advanced Matrix Theory**: Introduction, types of matrices-symmetric, skew-symmetric, Hermitian, skew-Hermitian, orthogonal, unitary matrices, Rank of a matrix - echelon form, normal form, consistency of system of linear equations (Homogeneous and Non-	**12**

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1 :	Understand the concepts of mean value theorems, higher order derivative, series expansion and associated problems
CO2 :	Acquire problem solving skills for finding area and volume using multiple integrals
CO3	Analyze sequences and series, including Fourier series
CO4	Apply the differentiation of functions of two variables for maximization and minimization
CO5	Evaluate basic matrix operations, linear systems of equations

Text Books

1: Advanced Engineering Mathematics, 10th Edition,

Erwin Kreyszig, 1998.

2: Calculus and Analytical Geometry, Thomas

and Finney, 1996.

3: Engineering Mathematics-I, Veerarajan T., , Tata McGraw-Hill, New Delhi, 2008.

4: Higher Engineering Mathematics, Ramana B.V., , Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Reference Books

1: Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 36th Edition, 2010.

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	3	2	1	1	1	0	0	0	1	0	0	0	2	1	1
CO	3	2	1	1	2	0	0	0	1	0	0	0	1	2	1

CO	**2**	**3**	**2**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**2**
CO	**3**	**2**	**2**	**2**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**1**	**2**
CO	**3**	**2**	**1**	**1**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**2**	**1**

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B.Tech ECE. AI & ML**	**Programme Code**	**BTEA**		
Course	**25BTEA 114**	**Number of Hours/Week**	**4**		
Semester	**I**	**Max. Marks**	**100**		
Year	**I**	**Credits**	**4**		
Applied Science Course					
Course Title	**ENGINEERING PHYSICS I**		**L**	**T**	**P**
			3	**1**	**0**
L-Lecture Hours T-Tutorial Hours P-Practical Hours					

COURSE OBJECTIVES:

1. To impart knowledge on the basics of the vector and scalar representation of forces and moments with Special reference to differentiation and integration methods
2. To acquire knowledge on moment of inertia and angular momentum
3. To impart knowledge on the concept of central force problems and uniformly

UNIT	**TOPI**	**HOURS**
I	Algebra of vectors-Describing motion: displacement, velocity, speed, acceleration; Cartesian, polar,spherical, and cylindrical polar coordinates; Mathematical tools- differentiation and integration methods, Taylor's series	**12**
II	Concept of inertia; concept of inertial and non-inertial frames; Newton's laws of motion; Application of Newton's laws: particles in gravitational field, simple harmonic motion, tension in a string, frictional force, viscous force, damped harmonic oscillator, forced harmonic oscillator and resonance. Concept of momentum- center of mass, conservation of momentum, momentum and flow of mass, work-energy theorem, conservative and non-conservative forces, conservation of energy, concept of power, conservation laws	**12**

III	Concept of moment of inertia; fixed axis rotation; angular displacement, angular velocity, and angular acceleration; vector nature of angular velocity; angular momentum; torque; conservation of angular momentum; gyroscope motion	**12**
IV	Central forces; central force motion as one-body problem; conservation laws in central forcemotion; Kepler's laws	**12**
V	Galilean transformations; uniformly accelerating systems; principle of equivalence; Physics in rotating coordinate systems	**12**

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Apply the concepts of polar, rectangular, cylindrical and spherical coordinatesystems.

CO2: Ability to differentiate statics and kinematics.

CO3: Demonstrate the ability to solve the problems in Newton's laws.

CO4: Appreciate to understand rotational kinetic energy & angular momentum.

CO5: Acquire adequate knowledge on conservation laws.

Text Books:

1. An Introduction to Mechanics by Daniel Kleppner, Robert Kolenkow, 2nd edition, 2006.

Reference Books:

2. Mechanics: Course of Theoretical Physics - Vol. 1, L.D. Landau and E.M. Lifshitz, ThirdEdition,CBS Publishers,2002.

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	2	3	0	0	0	0	0	0	0	0	0	2	0	0	2
CO	2	0	0	1	0	0	0	0	0	0	0	0	0	0	2
CO	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
CO	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B.Tech ECE. (AI & ML)**	**Programme Code**	**AEEN**		
Course Code	**25AEEN 811**	**Number of Hours/Week**	**3**		
Semester	**1**	**Max. Marks**	**100**		
Year	**1**	**Credits**	**3**		
Ability Enhancement Compulsory Course (AECC)					
Course Title	**EFFECTIVE COMMUNICATION**		**L**	**T**	**P**
			3	**0**	**0**
L-Lecture Hours	**T-Tutorial Hours**	**P-Practical Hours**			

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students to

- To define and explain the fundamental concepts, types, and processes of communication.
- To develop active listening and effective speaking skills to enhance interpersonal communications.
- To improve reading comprehension skills through different techniques.
- To apply grammar and vocabulary rules and public communication for accurate sentence structure and effective written communication.
- To prepare and deliver effective presentations by planning, structuring, and overcoming stage fright.

UNIT	TOPICS	HOURS
I	**Introduction to Communication** Definition of Communication, Types of Communication: Formal, Informal, Oral, Written, Verbal, non-verbal, interpersonal, intrapersonal Process of Communication: Sender, Message, Channel, Receiver, Feedback Barriers: Intrapersonal, Interpersonal, Organizational Overcoming Barriers	**10**
II	**Listening and Speaking:** Active Listening: Types of Listening, Reasons for poor listening Traits of the good listener, Effective Speaking: Achieving Confidence, Clarity, and Fluency, Public Speaking, Drafting the Speech	**10**

III	**Reading and Writing:** Reading Comprehension**:** Improving Comprehension Skills, Scanning and Skimming, Predicting the Content, Understanding the Gist, PQRST Technique Grammar and Vocabulary**:** Sentence Structure, Preposition, Punctuation, Articles, Common errors and Correct Usage, Word formation: Affixes, Active and Passive Vocabulary	**13**
IV	**Presentation Skills** Planning: Occasion, Audience, Purpose, Thesis Statement, Material, Outlining and Structuring, Guidelines for Effective Delivery, Strategies for Reducing Stage Fright	**8**
V	**Practice:** Grammar Bites, English Fluency Drills	**4**

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Analyse different types and processes of communication and the barriers that may arise.

CO2: Demonstrate active listening skills and strategies for confident and fluent public speaking.

CO3: Improve reading comprehension through effective reading techniques.

CO4: Apply proper grammar, sentence structures, and vocabulary for clear and correct writtencommunication.

CO5: Create structured presentations, incorporating techniques to manage stage fright and engage theaudience effectively.

Text Books

1. Kumar, Sanjay and Pushp Lata. *Communication Skills*. 2nd ed., Oxford University Press, 2015.
2. Raman, Meenakshi and Sangeetha Sharma. *Technical Communication: Principles and Practice*, 4th ed.,Oxford University Press, 2022.

Reference Books

1. Adair, John. *Effective Communication: The Most Important Management Skill of All.* Pan Books Publishers, 1997.
2. Gorrell, Robert M and Charlton Laird. *Modern English Handbook.* 6th ed., Pentice Hall Publications, 1976.
3. Rose, William. *GNVQ Core Skills Communication*. 2nd ed., Pitman Publishing, 1995.

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0
CO	0	0	0	0	0	0	0	0	2	3	0	0	0	0	0
CO	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
CO	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1
CO	0	0	0	0	0	0	0	0	3	3	0	0	0	0	2

3 – High, 2 – Average, 1 – Low , 0-Null

Semester I ends

SEMESTER II

Programme	**B.Tech ECE (AI & ML)**	**Programme Code**	**BTEA**		
Course Code	**25BTEA121**	**Number of Hours/Week**	**3**		
Semester	**II**	**Max. Marks**	**100**		
Year	**I**	**Credits**	**4**		
Core Course					
Course Title	**PYTHON PROGRAMMING**		**L**	**T**	**P**
			3	**0**	**0**

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- To Understand the fundamentals of the Python programming language and its historical development
- To Master Python basics, including data types, operators, tuples, dictionaries, and string manipulation.
- To demonstrate object oriented concept in python
- To familiarize with machine learning tools in python

UNIT	TOPICS	HOURS
I	**Introduction to python programming** Introduction to python ; setting up python programming environment; variables; strings and its operations; special characters; striping whitespace; numbers; comments; list and its operations; indexing; looping through lists; indentation; range function; slicing a list; copying list; looping through slice;	**8**
II	**Python datatypes** Tuples and its operations; relational operators; conditional statements – if, if-else, if-elif-else; multiple conditional blocks; dictionaries; key- value pairs – adding, modifying, removing; looping through dictionary; list of dictionaries; dictionary in a dictionary; user input function; type casting;	**8**

III	**Loop and function** While loop; break and continue; functions; arguments; passing arguments – positional arguments, keyword arguments, default values; optional arguments; returning from function; passing arbitrary number of arguments; storing functions in modules; import specific function or module;	**8**
IV	**OOPs in python** Classes;_init_() method; instance of a class; accessing attributes; calling methods; creating multiple instances; inheritance – parent class, child class; importing classes; files – reading a file, writing to a file, appending to a file; exceptions – try-except block, else block;	**8**
V	**Python machine learning tools** Python tools for machine learning; python modules – numpy, pandas, matplotlib, scipy; python based machine learning libraries – pytorch, tensorflow; virtual environment; machine learning application using python tools;	**8**

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1 : Comprehend the holistic view of programming language design and behavior

CO2 : Understand the programming concepts in abstract and paradigm level

CO3 : Structure python programs for solving

problems

CO4 : Develop python programs using OOP concept

CO5 : Execute ML project

using python tools

Text Books:

1. A Hands-On, Project-Based Introduction to Programming, Eric Matthes. Python Crash Course, 2nd Edition:No Starch Press, Inc., 2019.

Reference Books:

1. Boring Stuff with Python by Al Sweigart. AutomA ,William Pollock, 2015.

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	3	1	3	0	0	1	0	1	0	1	0	2	0	1	1
CO	3	3	2	3	1	2	0	2	1	1	0	2	1	1	2
CO	3	2	3	2	3	1	1	0	0	1	0	2	2	2	2
CO	3	2	3	2	1	2	1	0	1	1	0	1	2	1	3
CO	2	2	3	3	3	0	1	3	1	1	1	1	3	3	3

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	B.Tech ECE (AI & ML)	Programme Code			BTEA
Course Code	25BTEA221	Number of Hours/WK			2
Semester	II	Max. Marks			100
Year	I	Credit			
Core Course					
Course Title	PYTHON PROGRAMMING LABORATORY		L	T	P
			0	0	2

Course Objective:
The main learning objective of this course is to prepare the students for:

1. To learn fundamentals in python programming language
2. To introduce python modules for application
3. To familiarize python framework for machine learning applications
4. To develop machine learning application using python
5. To implement research

topic as part of python project

List of experiments:

S. NO	TITLE
1	Implement basic algebraic problems to get into python programming
2	Implement string manipulations problems using python
3	Implement problems using python datatypes such as tuple, list, dictionary etc.
4	Implement problems for python loops, conditional statements and functions
5	Implement object oriented programming concepts in python to solve different problems
6	Implement problems for python file manipulations
7	Implement standard machine learning algorithms using python frameworks such as TensorFlow, PyTorch etc.
8	Implement adavanced problems using python tools in a virtual environment as part of python project

6.

Course outcome:

On successful completion of this course, the student will be able to

CO1 : Develop basic coding skills in python

CO2 : Understand python datatypes, modules, frameworks etc.

CO3 : Implement standard ML algorithms using python tools

CO4 : Apply python frameworks for ML applications

CO5 : Create ML model for existing problems

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	3	1	3	0	0	1	0	1	0	1	0	2	0	0	2
CO	3	3	2	3	1	2	0	2	1	1	0	2	0	1	2
CO	3	2	3	2	3	1	1	0	0	1	0	2	2	2	3
CO	3	2	3	2	1	2	1	0	1	1	0	1	2	3	3
CO	2	2	3	3	3	0	1	3	1	1	1	1	3	3	3

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B.Tech ECE (AI&ML)**	**Programme Code**	**BTEA**
Course Code	**25BTEA122**	**Number of Hours/Week**	**3**
Semester	**II**	**Max. Marks**	**100**
Year	**I**	**Credits**	**3**
Applied Science			

Course Title	**PROBABILITY, STATISTICS AND STOCHASTIC PROCESSES**	**L**	**T**	**P**
		3	**0**	**0**

COURSE OBJECTIVES:

- **Understand fundamental probability concepts** and their applications in real-world scenarios.
- Analyze data using descriptive statistics **such as mean, variance, and standard deviation.**
- Apply probability distributions **(e.g., binomial, normal) to model and solve problems.**
- Conduct hypothesis testing and confidence intervals **to make informed statistical inferences.**
- Utilize statistical tools and software **for data analysis and decision-making in various fields.**

UNIT	**TOPIC**	**HOURS**
I	**Introduction to Probability:** Introduction to set algebra-sigma algebra- Borel sigma algebra-sequence of sets and its limits-lim-sup and lim-inf of sequence of sets; Axiomatic definition of probability-probability space-properties of probability functions-conditional probability-Bayes' rule-independence of events-continuity of probability functions-Borel Cantelli lemmas.	**10**
II	**Random variables**-distribution function and its property probability mass and density functions-symmetric distribution and its properties- expectation-moments moment generating function-Markov inequality- Chebyshev's inequality.	**6**
III	**Joint distributions**-marginal and conditional distributions-moments- independence of random variables-covariance, and correlation joint moment generating functions-additive properties of random variables- functions of random variables-ordered Statistics.	**8**

IV	**Special distributions**: Discrete uniform-Bernoulli-binomial-geometric negative binomial-hypergeometric-Poisson-exponential-gamma-normal- bivariate normal distribution; Population- sample-parameters- distributions of the sample mean and the sample variance for a normal population-Chi-Square-t, F distributions-law of large numbers–central limit theorem-point estimation-method of moments-maximum likelihood estimator-unbiasedness.	**8**
V	**Testing of hypothesis**: Null and alternate hypothesis-Neyman Pearson fundamental lemma and its applications-tests for one sample and two sample problems for normal populations-tests for proportions- confidence interval estimation-confidence interval for parameters of normal population	**10**

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- CO1: Understand Basic Probability Concepts
- CO2: Analyse Random Variables and Probability Distributions, Joint Distributions and ConditionalProbability
- CO3: Implement the Central Limit Theorem and Law of Large Numbers
- CO4: Perform Hypothesis Testing and Statistical Inference, Regression and Correlation for DataAnalysis
- CO5: Employ Statistical Tools in Engineering Applications

Text Books:

1. First Course in Probability, Sheldon Ross, 2022.
2. An Introduction to Probability and Statistics, V.K. Rohatgi and A.K. Md. E. Saleh, 2015.

Reference Books:

1. Introduction to Probability and Statistics, S. Milton and J.C. Arnold, 2003.
2. Introduction to Mathematical Statistics, R V Hogg, A Craig and J W McKean, 2019

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	2	2	1	0	1	0	0	0	0	0	0	2	2	1	1
CO	2	1	1	2	1	2	1	0	1	2	1	2	1	2	1
CO	2	0	2	2	2	2	2	1	1	2	0	0	2	0	2
CO	2	2	1	2	0	2	2	1	0	0	1	1	2	2	2
CO	2	2	0	2	1	2	2	2	1	1	2	2	0	0	2

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B.Tech ECE (AI&ML)**	**Programme Code**	**BTEA**
Course Code	**25BTEA123**	**Number of Hours/Week**	**4**

Semester	II	Max. Marks	100		
Year	I	Credits	4		
Applied Science					
Course Title	MATHEMATICS II		L	T	P
			3	1	0

COURSE OBJECTIVES:

- To develop a strong understanding of vector spaces, subspaces, basis, and dimension, as well as how linear transformations relate to matrices and their properties.
- To gain proficiency in solving systems of linear equations using techniques like Gaussian elimination, matrix operations, and determinants.
- To compute eigenvalues and eigenvectors, and apply them to diagonalize matrices, a critical tool for solving differential equations.
- To solve first-order and second-order ordinary differential equations (ODEs) with applications to physical, biological, and engineering problems.
- To understand the interplay between linear algebra and differential equations,

UNIT	TOPIC	HOURS
I	**Advanced Matrix Theory: Systems of linear equations**: Elementary operations-row-reduced echelon matrices-Gauss elimination LU factorization-linear independence-rank of a matrix-solutions of linear systems-existence and uniqueness.	**10**
II	**Vector spaces**: Vector space-subspaces-spanning space-bases and dimensions. Linear transformation-matrix representations of linear transformations-range space and rank-null space and nullity-the rank and nullity theorem-invertibility.	**6**
III	**Eigenvalues and eigenvectors**: Eigen values-eigenvectors and some applications of eigenvalue problems-Hermitian, skew-Hermitian, unitary matrices and their eigenvalues-eigen bases.	**8**
IV	**Elementary Canonical Forms:** Diagonalization: Annihilating polynomial-the minimal polynomial and the characteristic polynomial- Cayley-Hamilton theorem-real quadratic form; Inner product spaces: Inner product spaces-orthonormal bases- Gram-	**8**

V	**Ordinary Differential Equations**: Review of First Order ODE-Lipschitz condition-Picard`s theorem; Linear differential equations: Linear dependence and Wronskian-linear ODE with constant coefficients of higher order characteristic equations- Cauchy-Euler equations-method of undetermined coefficients-method of variation of parameters- solutions methods using Laplace Transform	**10**

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Learn different types of matrices, concept of rank, methods of matrix inversion and their applications,systems of linear equations, and manipulate vectors in various dimensions.
- Understand linear spaces, its basis and dimension with corresponding applications in the field of computerscience.
- Apply the concept of eigen values, eigen vectors, diagonalisation of matrices and orthogonalization in innerproduct spaces for understanding physical and engineering problems.
- Understand the first- and second-order ordinary differential equations (ODEs), both analytically andnumerically, with applications to real-world phenomena.
- Develop the skills to model physical systems using differential equations and linear algebra.

Text Books:

- Linear Algebra, Hoffman Kunze, 2015.
- Differential Equations, S. L Ross, 2007.

Reference Books:

- Introduction to Linear Algebra, Gilbert Strang, 2016.
- Advanced Engineering Mathematics, Erwin Kreyszig, 2010.

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	2	2	1	0	1	0	0	0	0	0	0	2	2	1	1
CO	2	1	1	2	1	2	1	0	1	2	1	2	1	2	1
CO	2	0	2	2	2	2	2	1	1	2	0	0	2	0	2
CO	2	2	1	2	0	2	2	1	0	0	1	1	2	2	2
CO	2	2	0	2	1	2	2	2	1	1	2	2	0	0	2

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B.Tech ECE (AI&ML)**	**Programme Code**	**BTEA**		
Course Code	**25BTEA124**	**Number of Hours/Week**	**3**		
Semester	**II**	**Max. Marks**	**100**		
Year	**I**	**Credits**	**4**		
Applied Science					
Course Title	**PHYSICS II**		**L**	**T**	**P**
			3	**0**	**0**
L-Lecture Hours **T-Tutorial Hours** **P-Practical Hours**					

COURSE OBJECTIVES:

1. To understand the working principle of various lasers, fibre optics and its applications.
2. To impart knowledge on acoustics and ultrasonics and its applications.
3. To provide knowledge on magnetism and superconducting phenomenon.
4. To. Analyze the Production of ultrasonic waves
5. To understand the electronic materials: metals, semiconductors, and insulators.

UNIT	**TOPICS**	**HOURS**
I	Introduction – Components of laser – Principle of laser action – Properties of laser – Spontaneous emission and stimulated emission – Einstein's coefficients – Population inversion – Types of lasers – He-Ne laser – Nd- YAG laser – Semiconductor laser – Industrial applications of laser – Medical applications of laser – Holography	**12**
II	Introduction – Propagation of light in optical fiber – Total internal reflection – Principle of optical fiber – Fractional Refractive index - Numerical aperture and acceptance angle – Types of optical fibers based on materials, modes of propagation and refractive index profile – Power losses in optical fibers – Fiber optic communication system – Fiber optic sensors – Temperature and Displacement – Fibre endoscope	**12**

III	Introduction – Classification of sound – Characteristics of musical sound – Pitch – Loudness – Quality – Intensity of sound – Weber Fechner Law – Reverberation – Reverberation Time – Sabine's Formula – Factors affecting the acoustics of a building – Absorption Coefficient – Measurement of Absorption coefficient	**12**
IV	Introduction – Production of ultrasonic waves – Magnetostriction Effect – Magnetostriction generator – Piezoelectric Effect – Properties of ultrasonics - Acoustic grating – Applications of ultrasonics – Industrial applications – SONAR – NDT — Medical Applications	**12**
V	Types of electronic materials: metals, semiconductors, and insulators, Dia, Para, Ferro magnetic materials properties, Temperature effects - Hysteresis curve, Hard and soft magnetic engineering materials - Applications: Magnetic recording and reading – Hard disc. Superconductors: Properties of superconducting materials - Type I and Type II superconductors- Applications: Maglev.	**12**

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Understand the concept of lasers and apply laser action in industries.

CO2: Explain and interpret the principle of fiber optics for different types of industrialsensors.

CO3: Discern the laws governing acoustics and implement the same in acoustic quieting.

CO4: Apply the fundamentals of ultrasonics in non-destructive testing.

CO5:

Evaluate and perceive various laws governing magnetism with special reference tomagnetic confinement for future power generation.

Text Books:

1. Engineering Physics, D.K. Bhattacharya and Poonam Tandon, New Delhi: Oxford University Press (2017)
2. Engineering Physics, S.Mani Naidu, New Delhi: Pearson India Education Services Pvt. Ltd., (2014)

Reference Books:

1. Engineering Physics, R.K. Gaur and S.L.Gupta, New Delhi: Dhanpat Rai Publications (P) Ltd. (2008)
2. Engineering Physics, Shatendra Sharma and Jyotsna Sharma, New Delhi: Pearson India Education ServicesPvt. Ltd., (2019)
3. Engineering Physics, Dattu R. Joshi, New Delhi: Tata McGraw Hill Education Private Ltd., (2010)
4. A Textbook of Engineering Physics, M. N. Avadhanulu and P. G. Kshirsagar, New Delhi: S.Chand andCompany Ltd., (2009)
5. Principles of Physics, Jearl Walker, David Halliday and Robert Resnick, Wiley India Pvt. Ltd., New Delhi(2014), Tenth Edition
6. Sears and Zemansky's University Physics with Modern Physics, Hugh D. Young and Roger A. Freedman, Pearson Education, New Delhi (2018), Fourteenth Edition.

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	2	1	0	0	0	0	0	0	0	0	0	2	2	0	0
CO	2	0	0	3	0	0	0	0	0	0	0	0	1	0	0
CO	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
CO	2	1	0	0	0	0	0	0	0	0	0	0	2	0	0
CO	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B.Tech ECE (AI&ML)**	**Programme Code**	**BTEA**		
Course	**25BTEA222**	**Number of Hours/Week**	**2**		
Semester	**II**	**Max. Marks**	**100**		
Year	**I**	**Credits**			
Applied Science					
Course Title	**PHYSICS II LAB**		**L**	**T**	**P**
			0	**0**	**2**
L-Lecture Hours	**T-Tutorial Hours**	**P-Practical Hours**			

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

1. Understand the concept of lasers and its action in industries.
2. Explain the principle of fiber optics for different types of industrial sensors.
3. Apply the basics of Lasers and Optical fibers.
4. Study the principles and applications of acoustics.
5. Discern the laws governing acoustics and its applications in acoustic quieting.
6. Relate the application of light in optical devices.

List of experime

1	Wavelength Determination – LASER diffraction
2	Particle size Determination – LASER diffraction
3	Attenuation of an Optical fibre– Fibre Optic Cable
4	Numerical Aperture measurement of an Optical Fibre– Fibre Optic Cable
5	Determination of Planck's constant – LED
6	Reverberation Time of a hall - Acoustics
7	Refractive index of a prism – Spectrometer
8	Wavelength of Mercury spectrum – Diffraction grating – Spectrometer

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	0	0	0	0	1	0	0	0	0	0	0	2	0	0	2
CO	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
CO	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
CO	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
CO	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0

3 – High, 2 – Average, 1 – Low , 0-Null

Programme	**B.TECH . ECE (AI & ML)**	**Programme Code**	**BTEA**
Course Code	**BTEA125**	**Number of Hours/ Week**	**3**
Semester	**II**	**Max. Marks**	**100**
Year	**I**	**Credits**	**3**

Course

Course Title	**NETWORK ANALYSIS**	**L**	**T**	**P**
		3	0	0

L-Lecture Hours T-Tutorial Hours P-Practical Hours

COURSE OBJECTIVES:

1. Understand Fundamental Circuit Elements and Theorems.
2. Analyze Transient Behavior and Resonance in Electrical Circuits
3. Develop Competence in Two-Port Networks and Network Functions.
4. Perform Sinusoidal Steady-State Analysis and Design Basic Filters.
5. Apply Graph Theory and Network Topology for Circuit Modeling

UNIT	**TOPICS**	**HOURS**
I	**Basic Circuit Elements and Network Theorems:** Circuit elements: R, L, C and their V-I relationships Kirchhoff's laws (KVL, KCL)- Source transformation and source shifting Mesh and Nodal analysis (with independent and dependent sources)- Superposition theorem, Thevenin's and Norton's theorems- Maximum power transfer theorem- Star-delta transformation	8

II	**Transient Analysis and Resonance:** Transient response of first-order (RL, RC) and second-order (RLC) circuits using differential equations- Initial and final value theorems- Solution using Laplace transform- Concept of resonance in RLC circuits: Series and parallel resonance Bandwidth, Q-factor, and selectivity	8
III	**Two-Port Networks and Network Functions** Two-port network parameters: Z, Y, h, ABCD- Reciprocity and symmetry in two-port networks- Interconnections of two-port networks- Network functions for one-port and two-port networks- Poles and zeros, frequency response	9
IV	**Sinusoidal Steady-State Analysis and Filters** Sinusoidal steady-state response: phasor concept- Impedance and admittance in phasor domain- Power: instantaneous, average, apparent, reactive, and complex power- Power factor and power factor correction- Basic filters: Low-pass, high-pass, band-pass, and band-stop using RLC components- Bode plot and frequency response	9

V	**Graph Theory, Network Topology, and Introduction to Signal Modeling** Graph theory: Network graphs, trees, twigs, links, incidence matrix, tie-set and cut-set matrix- Dual networks-, Topological formulation of circuit equations- Introduction to state-space analysis- Relevance of network analysis in machine learning and data-driven system modeling	9

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Apply Kirchhoff's laws, mesh and nodal analysis, and basic network theorems to analyze linear electric circuits.

CO2: Analyze transient and steady-state responses of RL, RC, and RLC circuits under various inputs.

CO3: Use Laplace transform techniques to solve electric circuits and determine system functions.

CO4: Evaluate two-port network parameters and assess their applications in circuit design.

CO5: Apply graph theory and network topology for systematic analysis of electrical networks.

Text Books

1. Engineering Circuit Analysis, *Author*: William H. Hayt, Jack E. Kemmerly, Steven M. Durbin *Publisher*: McGraw Hill Education 8th Edition, 2019*ISBN*: 9789353165059.
2. Fundamentals of Electric Circuits, *Author*: Charles K. Alexander, Matthew N.O. Sadiku *Publisher*: McGraw Hill Education *Edition*: Edition, 2021 *ISBN*: 9789354600306

Reference Books

1. William H. Hayt, Jack E. Kemmerly, Steven M. Durbin, “Engineering Circuit Analysis, McGraw Hill Education, “, 8th Edition, 2019, **ISBN**: 9789353165059.

2. Richard C. Dorf, James A. Svoboda, Introduction to Electric Circuits, Wiley India, 9th Edition, 2014, **ISBN**: 9781118477502.

Mapping of Course Outcomes (COs) with PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1	0	0	1	2	0	0	0	0	1	2	0	0	3
CO2	1	2	1	1	1	0	0	0	0	0	1	0	0	1	3
CO3	2	1	1	2	0	0	0	0	0	0	1	1	0	0	2
CO4	2	2	1	1	0	0	0	0	0	0	2	2	1	1	1
C05	3	2	1	2	3	0	0	0	0	0	1	1	0	2	2

3 – high, 2 – Average, 1 - low , 0-null

Programme	**B.Tech ECE (AI&ML)**	**Programme Code**	**BTEA**		
Course Code	**25EVST921**	**Number of Hours/Week**	2		
Semester	**II**	**Max. Marks**	**100**		
Year	**I**	**Credits**	**2**		
Value Added Course					
Course Title	**ENVIRONMENTAL SCIENCE**		**L**	**T**	**P**
			2	**0**	**0**
L-Lecture Hours	**T-Tutorial Hours**	**P-Practical Hours**			

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students to:

- To understand the Environmental Foundations
- To differentiate between renewable and non-renewable resources and assess the impacts of land use changes, land degradation, and water resource exploitation.
- To study the causes and effects of pollution and its impacts on earth
- To analyse the population causes, its effects and control measures.

UNIT	TOPIC	HOURS
I	**Introduction to Environmental studies** Definition and Scope of Environmental Studies - Interdisciplinary Nature of Environmental Science-Historical Perspectives on Environmental Issues- Principles of Sustainability and Sustainable Development,	6
II	**Natural Resources- Renewable and Non-renewable Resources** Land resources and land use change, Land degradation, soil erosion, Desertification- Deforestation- exploitation of surface and ground water, floods, droughts, conflicts over water Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	6
III	**Biodiversity and Conservation** Levels of biological diversity- genetic, species and ecosystem diversity, Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots.	6

IV	**Environmental Pollution** Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution - Nuclear hazards and human health risks-Solid waste management: Control measures of urban and industrial waste. Pollution case studies, Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture, Environment Laws: Environment Protection Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD), Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.	**12**

V	**Human Communities and the Environment** Human population growth: Impacts on environment, human health and welfare- Resettlement and rehabilitation of project affected persons, Disaster management: floods, earthquake, cyclones and landslides,	**10**

Andragogy

Class Room Lectures, Power point presentation, You Tube, Group Discussion, Seminar, Quiz,Formative Assessments, Brain storming, Activity.

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1	Define environmental studies and its interdisciplinary nature
CO2:	Analyze the structure and functions of various ecosystems, including aquatic ecosystems.
CO3	Evaluate the growing energy needs and the role of alternative energy sources
CO 4:.	Understand levels of biodiversity (genetic, species, and ecosystem) and identify biodiversity hotspots, with a focus on conservation strategies.
CO5 :	Evaluate the effects of human population growth on the environment and the importance of disaster management, resettlement, and environmental movements

Textbooks

1. Environmental and Sustainable Development, Keiji Ujikawa, Mikio Ishiwatari, Eric vanHullebusch, 1st Edition springer publishers Singapore, 2022.
2. Environmental Science: Toward A Sustainable Future, Dorothy F. Bourse and Richard T. Wright, 13thedition,Pearson publishers, 2017.
3. Social Learning in Environmental Management: Towards a Sustainable Future, Meg Keen,Valerie A. Brown, Rob Dyball, 2012.
4. Principles of Environmental Science, William P. Cunningham and Mary Ann Cunningham, 10thedition, Mc graw hill publishers, 2004.
5. Visualizing Environmental Science, Linda R. Berg, Mary Catherine Hager and David M.Hassenzahl, 2017.

Reference Books:

1. Waste Water Treatment, Rao, M.N., Datta, A.K.,Oxford and IBH Publishing Co. Pvt. Ltd, 1987.

2. Fundamentals of Ecology, Odum, E.P., Odum, H.T., and Andrews, J., , Saunders, Philadelphia, 1971,USA.

Mapping of Course Outcomes (CO's) with PO's & PSO's

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS
CO	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0
CO	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
CO	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0
CO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

3 – High, 2 – Average, 1 – Low , 0-Null

——————————————-“ Second Semester Ends” ——————————————