Dr. M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
DEEMED TO BE UNIVERSITY
University with Graded Autonomy Status
(An ISO 21001 : 2018 Certified Institution)
Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.

FACULTY OF ENGINEERING AND TECHNOLOGY

OUTCOME BASED EDUCATION

CURRICULUM & SYLLABUS

B. Tech
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(For the students admitted from 2024-2025)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE

Department of CSE Vision:
To become a Premier Institution of Excellence in Computer Science and Engineering that would develop self-sustaining and globally competent Computer Science and Information Technology Professionals.

Mission:
M1: Enable students with the best of Technologies and Knowledge merginginthe domain of Computer Science and Engineering.
M2: Equip the department laboratories with the power of in-demandTechnologies and Software for the On-Demand Industry.
M3: Share and Collaborate knowledge across the IT Industries for holistic development of skilled and talented students.
M4: Impart the students with Ethical values, Critical thinking and Broad- based computational skills.
M5: Motivate the students to compre hend problem sacross Inter Disciplinary Domains and offer innovative solution using ICT.

B. Tech-AI/MLProgram Educational Objectives (PEOs):

1. **PEO 1:** To excel in designing, developing, and deploying AI/ML solutions to solve real-world problems across diverse industries following ethical principles.
2. **PEO 2:** To understand the emerging technologies and pursue advanced studies or research in AI/ML and related fields.
3. **PEO 3:** To contribute to innovation and entrepreneurship by creating AI/ML-driven products, services, or startups which align with SDG goals.

B. Tech-AI/ML Program Specific Outcomes (PSOs):

1. **PSO 1:** Develop and implement AI/ML algorithms and models to solve real-world problems in areas such as natural language processing, computer vision, robotics, and data analytics.
2. **PSO 2:** Design and optimize intelligent systems using machine learning, deep learning, and reinforcement learning techniques.
3. **PSO 3:** Demonstrate proficiency in using AI/ML tools, frameworks, and platforms to build scalable and efficient solutions for industry and research following some ethical principles.

B. Tech-AI/MLProgram Outcomes (PO)

1. **PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineeringproblems.

2. PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

3. 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.

4. 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.

5. 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.

6. 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.

7. PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

8. PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

9. 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

10. 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.

11. 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.

Mapping of Mission with PEO

Mission/ PEO	PEO1	PEO2	PEO3
M1	3	3	3
M2	3	3	3
M3	3	2	3
M4	2	2	3
M5	2	2	3

Mapping of PEO with PO

PEO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PEO1	3	3	3	2	2	3	1	2	3	2	1
PEO2	3	3	3	2	2	3	2	2	1	3	1
PEO3	3	3	3	3	2	2	2	2	3	3	3
PEO4	3	3	3	1	2	3	3	3	3	2	1
PEO5	3	3	3	3	3	2	2	2	3	2	3
PEO6	3	2	2	1	2	3	3	3	3	3	3

Mapping of PEO with PSO

PEO/PSO	PSO1	PSO2	PSO3
PEO1	3	3	2
PEO2	2	2	1
PEO3	2	3	3
PEO4	3	1	2
PEO5	1	2	3
PEO6	2	2	2

Strength of Correlation 3-High2-Medium1-L

SEMESTER–I

COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/SLr	P/R	C	Category
EBEN22001	TECHNICAL ENGLISH	Ty	2	0/0	0/0	2	HS
EBMA22001	MATHEMATICS – I	Ty	3	1/0	0/0	4	BS
EBPH24ET1	ENGINEERING PHYSICS	ETL	2	0/0	2/0	3	BS
EBCH22ET1	ENGINEERING CHEMISTRY	ETL	2	0/0	2/0	3	BS
EBME22ET1	BASIC MECHANICAL & CIVIL ENGINEERING	ETL	2	0/0	2/0	3	ES
EBCS22ET1	C PROGRAMMING AND MS OFFICE TOOLS	ETL	1	0/0	2/0	2	PC
EBCC22I01	ORIENTATION TO ENTREPRENEURSHIP & PROJECT LAB	IE	1	0/0	1/0	1	ID
Credits Sub Total						18	

SEMESTER – II

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C	Category
EBMA24001	OPTIMIZATION TECHNIQUES FOR ARTIFICIAL INTELLIGENCE	Ty	3	1/0	0/0	4	BS
EBPH24001	SOLID STATE PHYSICS	Ty	3	0/0	0/0	3	BS
EBCH22001	TECHNICAL CHEMISTRY	Ty	3	0/0	0/0	3	BS
EBME22001	ENGINEERING GRAPHICS	Ty	2	0/0	2/0	3	ES
EBCS24001	FUNDAMENTALS OF COMPUTER ENGINEERING	Ty	3	0/0	0/0	3	PC
EBCC22I02	COMMUNICATIVE ENGLISH LAB	IE	1	0/0	1/0	1	HS
EBML24ET1	PROBLEM SOLVING USING PYTHON	ETL	1	0/0	2/0	2	PC
EBCC22I03	ENVIRONMENTAL SCIENCE (Audit Course)	IE	1	0/0	1/0	0	HS
EBFL23IXX	FOREIGN LANGUAGE-I	IE	1	0/0	1/0	1	HS
Credits Sub Total						20	

TOTAL CREDITS:38

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical

R: ResearchTy/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab Internal Evaluation

III SEMESTER								
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S. Lr**	**P/R**	**C**	**Category**
1	**EBMA24002**	**LINEAR ALGEBRA AND DISCRETE MATHEMATICS**	**Ty**	**3**	**1/0**	**0/0**	**4**	**BS**
2	**EBCS22002**	**DATA STRUCTURES**	**Ty**	**3**	**1/0**	**0/0**	**4**	**PC**
3	**EBCS22003**	**DATABASE MANAGEMENT SYSTEM**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
4	**EBEC22ID1**	**DIGITAL PRINCIPLES AND SYSTEM DESIGN**	**Ty**	**3**	**0/0**	**0/0**	**3**	**ID**
5	**EBCS22011**	**ARTIFICIAL INTELLIGENCE**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
PRACTICALS*								
1	**EBCC22ET1**	**UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY**	**ETL**	**1**	**0/0**	**2/0**	**2**	**ID**
2	**EBCS22L01**	**DATA STRUCTURES LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
3	**EBCS22L02**	**DATABASE MANAGEMENT SYSTEM LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
4	**EBEC22IL1**	**DIGITAL SYSTEMS LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**ID**
5	**EBCS22ET3**	**OBJECT ORIENTED PROGRAMMING WITH C++ / JAVA**	**ETL**	**2**	**0/0**	**2/0**	**3**	**PC**
Credits Sub Total							**25**	

IV SEMESTER								
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S. Lr**	**P/R**	**C**	**Category**
1	**EBMA24003**	**PROBABILITY AND STATISTICS**	**Ty**	**3**	**1/0**	**0/0**	**4**	**BS**
2	**EBCS22005**	**OPERATING SYSTEM**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
3	**EBCS22004**	**DESIGN AND ANALYSIS OF ALGORITHMS**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
4	**EBCS22015**	**MACHINE LEARNING**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
5	**EBCC22I04/ EBCC22I05**	**THE INDIAN CONSTITUTION/ THE INDIAN TRADITIONAL KNOWLEDGE (Audit Course)**	**IE**	**2**	**0/0**	**0/0**	**0**	**ID**
PRACTICALS*								
1	**EBCS22L03**	**DESIGN AND ANALYSIS OF ALGORITHMS LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
2	**EBCS22L04**	**OPERATING SYSTEM LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
3	**EBML24L01**	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
4	**EBML24I01**	**TECHNICAL SKILL I**	**IE**	**0**	**0/0**	**2/0**	**1**	**SC**
5	**EBCC22I06**	**SOFT SKILL I -Employability Skills**	**IE**	**0**	**0/0**	**2/0**	**1**	**SC**
6	**EBML24ET2**	**DESIGN THINKING**	**ETL**	**2**	**0/0**	**2/0**	**3**	**PC**
7	**EBML24ET3**	**NATURAL LANGUAGE PROCESSING**	**ETL**	**2**	**0/0**	**2/0**	**3**	**PC**
Credits Sub Total							**24**	

C: Credits L: Lecture T: Tutorial S. Lr: Supervised Learning P: Problem / Practical

R: Research Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab Internal Evaluation

V SEMESTER								
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S. Lr**	**P/R**	**C**	**Category**
1	**EBML24001**	**COMPUTER ARCHITECTURE**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
2	**EBML24002**	**ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
3	**EBML24EXX**	**PROGRAM ELECTIVE I**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PE**
4	**EBXX22OEX**	**OPEN ELECTIVE I**	**Ty**	**3**	**0/0**	**0/0**	**3**	**ID**
5	**EBOL22I01**	**ONLINECOURSE (NPTEL/SWAYAM /Any MOOC approved by AICTE/UGC)**	**IE**	**1**	**0/0**	**1/0**	**1**	**ID**
6	**EBML24003**	**SOFTWARE ENGINEERING AND SYSTEM DEVELOPMENT**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
PRACTICALS*								
1	**EBML24L02**	**SOFTWARE ENGINEERING LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
2	**EBML24L03**	**ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
3	**EBML24I02**	**TECHNICAL SKILL II**	**IE**	**0**	**0/0**	**2/0**	**1**	**SC**
4	**EBML24ET4**	**BIO INSPIRED ALGORITHM**	**ETL**	**2**	**0/0**	**2/0**	**3**	**PC**
5	**EBFL23IXX**	**FOREIGN LANGUAGE – II**	**IE**	**1**	**0/0**	**1/0**	**1**	**HS**
Credits Sub Total							**23**	

VI SEMESTER								
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S. Lr**	**P/R**	**C**	**Category**
1	**EBML24004**	**GENERATIVE AI**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
2	**EBML24005**	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TOOLS**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
3	**EBCS22007**	**COMPUTER NETWORKS**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
4	**EBXX22OEX**	**OPEN ELECTIVE II**	**Ty**	**3**	**0/0**	**0/0**	**3**	**ID**
5	**EBML24EXX**	**PROGRAM ELECTIVE II**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PE**
PRACTICALS*								
1	**EBML24L04**	**GENERATIVE AI LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
2	**EBML24L05**	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TOOLS LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
3	**EBCC22I07**	**SOFT SKILL II -QUALITATIVE AND QUANTITATIVE SKILLS**	**IE**	**0**	**0/0**	**2/0**	**1**	**SC**
4	**EBML24I03**	**TECHNICAL SKILL III**	**IE**	**0**	**0/0**	**2/0**	**1**	**SC**
5	**EBML24I04**	**MINI PROJECT/INTERNSHIP**	**IE**	**0**	**0/0**	**3/0**	**1**	**SC**
Credits Sub Total							**20**	

C: Credits L: Lecture T: Tutorial S. Lr: Supervised Learning P: Problem / Practical
R: Research Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab Internal Evaluation

VII SEMESTER								
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S. Lr**	**P/R**	**C**	**Category**
1	**EBML24006**	**BIG DATA FRAMEWORK**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
2	**EBML24007**	**LARGE LANGUAGE MODELS**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
3	**EBML24008**	**DATA EXPLORATION AND DATA VISUALIZATION**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
4	**EBML24009**	**USER INTERFACE AND EXPERIENCE DESIGN**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PC**
5	**EBML24EXX**	**PROGRAM ELECTIVE III**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PE**
PRACTICALS*								
1	**EBXX22OLX**	**OPEN LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**ID**
2	**EBML24L06**	**BIG DATA FRAMEWORK LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
3	**EBML24L07**	**DATA VISUALIZATION LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**	**PC**
4	**EBML24I05**	**PROJECT PHASE – 1**	**IE**	**0**	**0/0**	**3/3**	**2**	**P**
Credits Sub Total							**20**	

VIII SEMESTER								
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S. Lr**	**P/R**	**C**	**Category**
1	**EBME22E24**	**TOTAL QUALITY MANAGEMENT**	**Ty**	**3**	**0/0**	**0/0**	**3**	**ID**
2	**EBML24EXX**	**PROGRAM ELECTIVE IV**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PE**
3	**EBML24EXX**	**PROGRAM ELECTIVE V**	**Ty**	**3**	**0/0**	**0/0**	**3**	**PE**
PRACTICALS*								
1	**EBML24L08**	**PROJECT PHASE – II**	**Lb**	**0**	**0/0**	**16/16**	**8**	**P**
Credits Sub Total							**17**	

TOTAL CREDITS: 167

C: Credits L: Lecture T: Tutorial S. Lr: Supervised Learning P: Problem / Practical
R: Research Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab Internal Evaluation

Credit Summary:

Semester: 1 : 18
Semester: 2 : 20
Semester: 3 : 25
Semester: 4 : 24
Semester: 5 : 23
Semester: 6 : 20
Semester: 7 : 20
Semester: 8 : 17

Total Credits : 167

PROGRAM ELECTIVE -I							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/ IE**	**L**	**T/ S. Lr**	**P/R**	**C**
1.	**EBML24E01**	**SOFTWARE TESTING AND AUTOMATION**	**Ty**	**3**	**0/0**	**0/0**	**3**
2.	**EBML24E02**	**GAME THEORY**	**Ty**	**3**	**0/0**	**0/0**	**3**
3.	**EBML24E03**	**AI IN ROBOTIC**	**Ty**	**3**	**0/0**	**0/0**	**3**
4.	**EBML24E04**	**SOCIAL NETWORK ANALYSIS**	**Ty**	**3**	**0/0**	**0/0**	**3**
5.	**EBML24E05**	**IMAGE PROCESSING**	**Ty**	**3**	**0/0**	**0/0**	**3**

PROGRAM ELECTIVE -II							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/ IE**	**L**	**T/ S. Lr**	**P/R**	**C**
1.	**EBML24E06**	**FEDERATED LEARING**	**Ty**	**3**	**0/0**	**0/0**	**3**
2.	**EBML24E07**	**AUGMENTED AND VIRTUAL REALITY**	**Ty**	**3**	**0/0**	**0/0**	**3**
3.	**EBML24E08**	**SOFTWARE QUALITY ASSURENCE**	**Ty**	**3**	**0/0**	**0/0**	**3**
4.	**EBML24E09**	**MACHINE LEARNING BIO-MEDICAL IMAGING**	**Ty**	**3**	**0/0**	**0/0**	**3**
5.	**EBML24E10**	**PATTERN RECOGNITION**	**Ty**	**3**	**0/0**	**0/0**	**3**

PROGRAM ELECTIVE -III							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/ IE**	**L**	**T/ S. Lr**	**P/R**	**C**
1.	**EBML24E11**	**STREAMING DATA ANALYTICS**	**Ty**	**3**	**0/0**	**0/0**	**3**
2.	**EBML24E12**	**PROBABILISTIC ALGORITHMS**	**Ty**	**3**	**0/0**	**0/0**	**3**
3.	**EBML24E13**	**BLOCK CHAIN AND ARTIFICIAL INTELLIGENCE INTEGRATIVES**	**Ty**	**3**	**0/0**	**0/0**	**3**
4.	**EBML24E14**	**PREDICTIVE ANALYTICS**	**Ty**	**3**	**0/0**	**0/0**	**3**
5.	**EBML24E15**	**PRIVACY ENGINEERING**	**Ty**	**3**	**0/0**	**0/0**	**3**

PROGRAM ELECTIVE -IV							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/ IE**	**L**	**T/ S. Lr**	**P/R**	**C**
1.	**EBML24E16**	**SYMBOLIC ARTIFICIAL INTELLIGENCE**	**Ty**	**3**	**0/0**	**0/0**	**3**
2.	**EBML24E17**	**PROMPT ENGINEERING**	**Ty**	**3**	**0/0**	**0/0**	**3**
3.	**EBML24E18**	**COMPUTER VISION**	**Ty**	**3**	**0/0**	**0/0**	**3**
4.	**EBML24E19**	**SOFTWARE PROJECT MANAGEMENT**	**Ty**	**3**	**0/0**	**0/0**	**3**
5.	**EBML24E20**	**ARTIFICIAL INTELEGENCE IN IOT**	**Ty**	**3**	**0/0**	**0/0**	**3**

PROGRAM ELECTIVE -V							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/ IE**	**L**	**T/ S. Lr**	**P/R**	**C**
1.	**EBML24E21**	**ARTIFICIAL INTELLIGENCE IN HEALTH CARE**	**Ty**	**3**	**0/0**	**0/0**	**3**
2.	**EBML24E22**	**AI/ML IN BUISNESS ANALYTICS**	**Ty**	**3**	**0/0**	**0/0**	**3**
3.	**EBML24E23**	**AI IN HUMAN COMPUTER INTERACTION**	**Ty**	**3**	**0/0**	**0/0**	**3**
4.	**EBML24E24**	**AI IN QUANTUM COMPUTING**	**Ty**	**3**	**0/0**	**0/0**	**3**
5.	**EBML24E25**	**ARTIFICIAL INTELLIGENCE IN CYBER SECURITY**	**Ty**	**3**	**0/0**	**0/0**	**3**

OPEN ELECTIVES OFFERED FOR AI/ML STUDENTS

ELECTRONICS AND COMMUNICATION ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/S Lr	P/R	C
1	EBEC22OE1	Internet of Things and its Applications	Ty	3	0/0	0/0	3
2	EBEC22OE2	Cellular Mobile communication	Ty	3	0/0	0/0	3
3	EBEC22OE3	Satellite and its Applications	Ty	3	0/0	0/0	3
4	EBEC22OE4	Fundamentals of Sensors	Ty	3	0/0	0/0	3
5	EBEC22OE5	Microprocessor Based System Design	Ty	3	0/0	0/0	3
6	EBEC22OE6	Industry 4.0 Concepts	Ty	3	0/0	0/0	3

ELECTRICAL AND ELECTRONICS ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/S Lr	P/R	C
1	EBEE22OE1	Electrical Safety for Engineers	Ty	3	0/0	0/0	3
2	EBEE22OE2	Energy Conservation Techniques	Ty	3	0/0	0/0	3
3	EBEE22OE3	Electric Vehicle Technology	Ty	3	0/0	0/0	3
4	EBEE22OE4	Biomedical Instrumentation	Ty	3	0/0	0/0	3
5	EBEE22OE5	Industrial Instrumentation	Ty	3	0/0	0/0	3
6	EBEE22OE6	Solar Energy Conversion System	Ty	3	0/0	0/0	3
7	EBEE22OE7	Wind Energy Conversion System	Ty	3	0/0	0/0	3
8	EBEE22OE8	Energy Storage Technology	Ty	3	0/0	0/0	3
9	EBEE22OE9	Electrical Machines	Ty	3	0/0	0/0	3

MECHANICAL ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/S Lr	P/R	C
1	EBME22OE1	Industrial Engineering	Ty	3	0/0	0/0	3
2	EBME22OE2	Refrigeration and Air conditioning	Ty	3	0/0	0/0	3
3	EBME22OE3	Automobile Engineering	Ty	3	0/0	0/0	3
4	EBME22OE4	Industrial Robotics	Ty	3	0/0	0/0	3
5	EBME22OE5	Sustainable Energy	Ty	3	0/0	0/0	3
6	EBME22OE6	Composite Materials	Ty	3	0/0	0/0	3
7	EBME22OE7	Industry 4.0	Ty	3	0/0	0/0	3
8	EBME22OE8	Virtual and Augmented Reality	Ty	3	0/0	0/0	3

C: Credits L: Lecture T: Tutorial S. Lr: Supervised Learning P: Problem / Practical
R: Research Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab Internal Evaluation

CIVIL ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/S Lr	P/R	C
1	EBCE22OE1	Water Pollution and Its management	Ty	3	0/0	0/0	3
2	EBCE22OE2	Air Pollution Control	Ty	3	0/0	0/0	3
3	EBCE22OE3	Green Building and Vastu Concepts	Ty	3	0/0	0/0	3
4	EBCE22OE4	Climate Change and Sustainable Development	Ty	3	0/0	0/0	3
5	EBCE22OE5	Intelligent Transportation Systems	Ty	3	0/0	0/0	3
6	EBCE22OE6	Environment, Health and Safety in Industries	Ty	3	0/0	0/0	3
7	EBCE22OE7	Industrial Pollution Prevention and Cleaner Production	Ty	3	0/0	0/0	3
8	EBCE22OE8	Fundamentals of nanoscience	Ty	3	0/0	0/0	3

BIOTECHNOLOGY

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/S Lr	P/R	C
1	EBBT22OE1	Food and Nutrition	Ty	3	0/0	0/0	3
2	EBBT22OE2	Human Physiology	Ty	3	0/0	0/0	3
3	EBBT22OE3	Clinical Biochemistry	Ty	3	0/0	0/0	3
4	EBBT22OE4	Bioprocess Principles	Ty	3	0/0	0/0	3
5	EBBT22OE5	Biosensors and Biomedical Devices in Diagnostics	Ty	3	0/0	0/0	3
6	EBBT22OE6	Basic Bioinformatics	Ty	3	0/0	0/0	3

CHEMICAL ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/S Lr	P/R	C
1	EBCT22OE1	Fundamentals of Nanoscience	Ty	3	0/0	0/0	3
2	EBCT22OE2	Electrochemical Engineering	Ty	3	0/0	0/0	3
3	EBCT22OE3	Alternative Fuels and Energy System	Ty	3	0/0	0/0	3
4	EBCT22OE4	Petrochemical Unit Processes	Ty	3	0/0	0/0	3
5	EBCT22OE5	Principles of Desalination Technologies	Ty	3	0/0	0/0	3
6	EBCT22OE6	Piping Design Engineering	Ty	3	0/0	0/0	3
7	EBCT22OE7	E- Waste Management	Ty	3	0/0	0/0	3

C: Credits L: Lecture T: Tutorial S. Lr: Supervised Learning P: Problem / Practical
R: Research Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab Internal Evaluation

Dr APJ Abdul Kalam Center for Research

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
1	EBMG22OE1	Technical Entrepreneurship	Ty	3	0/0	0/0	3

OPEN LAB OFFERED FOR AI/ML STUDENTS
ELECTRONICS AND COMMUNICATION ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/SLr	P/R	C
1	EBEC22OL1	Sensors and IoT Lab	Lb	0	0/0	3/0	1
2	EBEC22OL2	Robotics Control Lab	Lb	0	0/0	3/0	1
3	EBEC22OL3	Basics of MATLAB	Lb	0	0/0	3/0	1

ELECTRICAL AND ELECTRONICS ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
1	EBEE22OL1	Transducer Lab	Lb	0	0/0	3/0	1
2	EBEE22OL2	PLC and SCADA Lab	Lb	0	0/0	3/0	1
3	EBEE22OL3	Electrical Maintenance Lab	Lb	0	0/0	3/0	1
4	EBEE22OL4	Power Electronics Lab	Lb	0	0/0	3/0	1
5	EBEE22OL5	Bio Medical Instrumentation Lab	Lb	0	0/0	3/0	1
6	EBEE22OL6	Electrical Machines Lab	Lb	0	0/0	3/0	1

MECHANICAL ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
1	EBME22OL1	Internal Combustion Engines and Steam Lab	Lb	0	0/0	3/0	1
2	EBME22OL2	ComputerAidedDesign and Simulation Lab	Lb	0	0/0	3/0	1
3	EBME22OL3	Engineering Metrology Lab	Lb	0	0/0	3/0	1
4	EBME22OL4	Automation Lab	Lb	0	0/0	3/0	1
5	EBME22OL5	Virtual and Augmented Reality Lab	Lb	0	0/0	3/0	1

C: Credits L: Lecture T: Tutorial S. Lr: Supervised Learning P: Problem / Practical
R: Research Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab Internal Evaluation

CIVIL ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
1	EBCE22OL1	Building Drawing Practice using Auto CADD	Lb	0	0/0	3/0	1
2	EBCE22OL2	Geographical Information System and Mapping Lab	Lb	0	0/0	3/0	1
3	EBCE22OL3	Environmental Engineering Laboratory	Lb	0	0/0	3/0	1

BIOTECHNOLOGY

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/SL r	P/R	C
1	EBBT22OL1	Basic Biochemistry Lab	Lb	0	0/0	3/0	1
2	EBBT22OL2	Basic Bioprocess Lab	Lb	0	0/0	3/0	1
3	EBBT22OL3	Basic Microbiology Lab	Lb	0	0/0	3/0	1
4	EBBT22OL4	Basic Bioinformatics Lab	Lb	0	0/0	3/0	1

CHEMICAL ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S Lr	P/R	C
1	EBCT22OL1	Chemical Separation Lab	Lb	0	0/0	3/0	1
2	EBCT22OL2	Chemical Composition Analysis Lab	Lb	0	0/0	3/0	1
3	EBCT22OL3	Alternate Fuel Lab	Lb	0	0/0	3/0	1
4	EBCT22OL4	Food Testing Laboratory	Lb	0	0/0	3/0	1

C: Credits L: Lecture T: Tutorial S. Lr: Supervised Learning P: Problem / Practical
R: Research Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab Internal Evaluation

LIST OF FOREIGN LANGUAGES

S.NO	COURSE CODE	COURSE NAME
1	EBFL23I01	FRENCH-I
2	EBFL23I02	GERMAN-I
3	EBFL23I03	JAPANESE-I
4	EBFL23I04	ARABIC-I
5	EBFL23I05	CHINESE-I
6	EBFL23I06	RUSSIAN-I
7	EBFL23I07	SPANISH-I

S.NO	COURSE CODE	COURSE NAME
1	EBFL23I08	FRENCH-II
2	EBFL23I09	GERMAN-II
3	EBFL23I10	JAPANESE-II
4	EBFL23I11	ARABIC-II
5	EBFL23I12	CHINESE-II
6	EBFL23I13	RUSSIAN-II
7	EBFL23I14	SPANISH-II

C: Credits L: Lecture T: Tutorial S. Lr: Supervised Learning P: Problem / Practical
R: Research Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab Internal Evaluation

Components of Curriculum and Credits Distribution

Course Component	Description	No of courses	Credits	Total	Credit Weightage	Contact Hours
Basic Science	Theory	7	23	29	17.36	330
	Lab	-	-			-
	Etl	2	6			120
Engineering Science	Theory	1	3	6	3.60	60
	Lab	0	0			-
	Etl	1	3			60
Humanities and social science	Theory	5	5	5	2.99	90
	Lab	0	0			30
	Etl	0	0			-
Program core	Theory	17	54	78	46.70	735
	Lab	11	11			450
	Etl	5	13			270
Program Electives	Theory	5	15	15	8.98	225
	Lab					
	Etl					
Open Elective	Theory	2	6	7	4.20	90
	Lab	1	1			45
Inter Disciplinary	Theory	5	8	11	6.60	240
	Lab	1	1			120
	Etl	1	2			45
Skill Component		6	6	6	3.59	195
Project		2	10	10	5.98	90
If others any						
	TOTAL	72	167	167	100	3195

List of New courses/value added courses//life skills/Electives/interdisciplinary /courses focusing on employability/entrepreneurship/skill development

S. No	New courses	Value added courses	Life skill/ ETL	Electives	Inter Disciplinary	Focus on employability/ Entrepreneurship/ skill development.
1	C Programming and MS Office Tools	Technical Skill I	C Programming and MS Office Tools	Total number of program Electives: 25 (as given in the curriculum)	Digital Principles and System Design	Technical Skill I
2	Fundamentals of Computer Engineering	Technical Skill II	Python Programming	Total number of Open Electives (Theory & Lab): 71 (as given in the curriculum)	Basic Electrical Engineering	Technical Skill II
3	Web Design using php&MySQL	Technical Skill III	Object Oriented Programming with C++		Digital Systems Lab	Technical Skill III
4	Web Design using php&MySQL Lab	Universal human values: Understanding harmony	JAVA Programming		Microprocessor And Microcontrollers	Mini Project/ Internship
5	Artificial Intelligence	Soft Skill I - Employability Skills	User Experience Design		Microprocessor And Microcontrollers Lab	Project Phase – 1
6	Big Data Analytics	Soft Skill II - Qualitative and Quantitative Skills	Soft Skill I - Employability Skills		Online Course (NPTEL/SWAYAM /Any MOOC approved by AICTE/UGC)	Project Phase – II
7	Connected Business		Soft Skill II - Qualitative and Quantitative Skills		Total Quality Management	
8	Cloud Computing		Universal human values: Understanding harmony			
9	Machine learning		Foreign Language -I			
10	Data Analytics Lab using Machine Learning Algorithm		Foreign Language -II			
11	Cloud computing Lab		The Indian Constitution/ The Indian Traditional Knowledge			

I SEMESTER

COURSECODE	COURSE NAME: TECHNICAL ENGLISH	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBEN22001	Prerequisite: PassinPlus2 English	Ty	2	0/0	0/0	2

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To refresh and stimulate students' English learning through Content Integrated Language Learning to haveanin-depth understanding of the components of English language and its use in communication that they are competent in inter-personal and academic communication for a successful career.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Refresh and stimulate their English learning through Content Integrated Language Learning
CO2	Haveanin-depth understanding of the components of English language and its use in communication.
CO3	Strengthen their vocabulary and syntactic knowledge forusein academic and technical communication
CO4	Learnt one gotiate meaning in inter-personal and academic communication for asuccessful career
CO5	Engagein organized academic and professional writing for life-long learning and research

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		1	1	3	1	1	2	3	3	1	3
CO2		1		2	3	2	1	1	3	3		3
CO3	1	1	1	1	2	1		2	3	3	1	3
CO4	1	2	1	1	3		1		2	2	1	2
CO5	1	2	1		2	1		1	3	3	1	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1			
CO2	1			
CO3	1	1		2
CO4				
CO5			1	1

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanities and social Science	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical /Project
			√						

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBEN22001	TECHNICAL ENGLISH	Ty	2	0/0	0/0	2

Unit-I: Vocabulary Development: **6 Hrs**

Affixes: prefixes and suffixes and word formation–synonyms and antonyms-nominal compounds, expanding using numbers and approximation-preposition prepositional phrases, preposition+relativepronoun- adjective: degrees of comparison, formation of adjectives, irregular comparatives-Infinitive and Gerunds

Unit-II: Grammar: **6 Hrs**

Tenses- auxiliary and modal –voice: active, passive and impersonal passive - Questions: Wh-pattern, Yes/no questions, tag questions – adverbs and adverbial clauses- 'If' clause, 'cause and effect', 'purpose'- Concord: subject-verb agreement

Unit-III: Reading: **6 Hrs**

Comprehension: extracting relevant information from the text, by skimming and scanning and inferring, identifying lexical and contextual meaning for specific information, identifying the topic sentence and its role in each paragraph, comprehension exercises - Note - making - Précis writing-instructions, suggestions and recommendations.

Unit-IV: Writing: **6 Hrs**

Jumbled sentences - paragraph writing coherence devices- discourse markers. Essay writing- Letter writing, Informal and formal: seeking permission to undergo practical training, letter to an editor of a newspaper complaining about civic problems and suggesting suitable solutions

Unit-V: Visual Aids in Communication: **6 Hrs**

Interpretation of diagrams-tables, flowcharts, piecharts and barcharts, and their use in Business reports

Total Hours: 30

Text book:

Panorama: Content Integrated Language Learning forEngineers, M. Chandrasena Rajeswaran & R. Pushkala, Vijay Nicole Imprints Pvt. Ltd., Chennai

References:

1. Bhatnagar & Bhatnagar, Communicative English for Engineers and Professionals, Pearson
2. Wrenand Martin: Grammar and Composition, Chand & Co,2006
3. https://learnenglish.britishcouncil.org
4. www.better-english.com/grammar/preposition.

COURSE CODE	COURSENAME: MATHEMATICS-I	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBMA22001	Prerequisite: Higher secondary Mathematics	Ty	3	1/0	0/0	4

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Apply the Basic concepts in Algebra
- Use the Basic concepts in Matrices
- Identify and solve problem sin Trigonometry
- Understand the basic concepts in Differentiation
- Apply the basic concepts in Functions of Several Variables

COURSE OUTCOMES(Cos): Students will be able to

CO1	Find the summation of given series of binomial, exponential and logarithmic
CO2	Transformanon-diagonal matrix into an equivalent diagonal matrix using orthogonal transformation
CO3	Find the expansion of trigonometric function into an infinite series and separate real and imaginary parts
CO4	Find the maxima and minima of the given function
CO5	Evaluate the partial/total differentiation and maxima/minima of function of several variable

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	2	2	3	3	1	3
CO2	3	3	1	2	3	2	1	2	3	1	2	3
CO3	3	3	1	2	2	3	1	1	2	3	2	1
CO4	3	2	2	2	1	2	2	2	2	3	2	2
CO5	3	3	1	2	1	1	2	1	2	2	1	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4	
CO1	2	3	1	2	
CO2	2	3	1	2	
CO3	2	3	1	2	
CO4	2	3	1	2	
CO5	2	3	1	2	

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanitiesand social Science	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical /Project
	√								

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBMA22001	MATHEMATICS–I	Ty	3	1/0	0/0	4

UNIT-I: ALGEBRA: **12 Hrs**

Binomial, Exponential, Logarithmic Series (without proof of theorems) – Problems on Summation, Approximation and Coefficients.

UNIT-II: MATRICES: **12 Hrs**

Characteristic equation–Eigen values and Eigen vectors of a real matrix–Properties of Eigen values–Cayley -Hamilton theorem(withoutproof)–Orthogonal reduction of asymmetric matrix to Diagonal form.

UNIT-III: TRIGONOMETRY: **12 Hrs**

Expansions of Sin nθ, Cos nθin powers of SinθandCosθ–Expansion of Tan nθ– Expansions of $Sin^{n}\theta$and$Cos^{n}\theta$in terms of Sines and Cosines of multiples of θ– Hyperbolic functions – Separation into real and imaginary parts.

UNIT-IV: DIFFERENTIATION: **12 Hrs**

Basic concepts of Differentiation –Elementary differentiation methods –Parametric functions – Implicit function –Leibnitz theorem (without proof) – Maxima and Minima– Points ofinflection.

UNIT-V: FUNCTIONS OF SEVERAL VARIABLES: **12 Hrs**

Partial derivatives – Total differential – Differentiation of implicit functions – Taylor's expansion – Maxima and Minima by Lagrange's Method of undetermined multipliers – Jacobians.

Total Hours: 60

Text&ReferenceBooks:

- **Kreyszig, E.** *Advanced Engineering Mathematics* (10th ed.), John Wiley & Sons, (2011).
- **Grewal, B. S.** *Higher Engineering Mathematics*, Khanna Publishers, (2012).
- **John Bird**, *Basic Engineering Mathematics* (5th ed.), Elsevier Ltd., (2010).
- **Veerarajan, T.** *Engineering Mathematics (for first year)*, Tata McGraw-Hill Publishing Co., (2008).
- **P. Kandasamy, K. Thilagavathy, and K. Gunavathy**, *Engineering Mathematics Vol. I* (4th Revised ed.), S. Chand & Co. Publishers, New Delhi, (2000).
- **John Bird**, *Higher Engineering Mathematics* (5th ed.), Elsevier Ltd., (2006).

COURSE CODE	COURSE NAME: ENGINEERING PHYSICS	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBPH24ET1	Prerequisite: Higher Sec. Physics	ETL	2	0/0	2/0	3

C: Credits, L: Lecture, T: Tutorial, S Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/ Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

- Outline the relation between Science, Engineering & Technology.
- Demonstrate competency in understanding basic concepts.
- Apply fundamental laws of Physics in Engineering & Technology.
- Identify and solve problems using physics concepts.
- Produce and present activities associated with the course through effective technical communication.

COURSE OUTCOMES(Cos):
Students completing this course were able to

CO1	Demonstrate competency in understanding basic concepts.
CO2	Utilize scientific methods for formal investigations &demonstrate competency with Experimental methods and verify the concept to content knowledge.
CO3	Identify and provide solutions for engineering problems.
CO4	Relate the technical concepts today today life and to practical situations.
CO5	Think analytically to interpret concepts.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		2								
CO2	3	3		2	2					1		
CO3	3	2	2	2		2	1					
CO4	3					2	2	1				2
CO5	3											1

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicSciences	Engg.Science	Humanities &social Science	ProgramCore	Program Elective	OpenElective	Practical/Project	Internships/Technical Skills	SoftSkills
	√								

COURSE CODE	COURSE NAME: ENGINEERING PHYSICS	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBPH24ET1	Prerequisite: HigherSec. Physics	ETL	2	0/0	2/0	3

UNIT-I: PROPERTIES OF MATTER: **12 Hrs**

Elasticity-stress, strainand Hook'slaw-Poisson'sratio-three moduli of elasticity-twisting couple on a wire–Shafts– Solid & Hollow Shafts – Bending moment – Youngs Modulus Determination by Non uniform Bending -I form of girders. Viscosity - flow of liquid through a narrow tube: Poiseuille's law (Qualitative) - Ostwald`s viscometer – Lubrication

Lab Component–1. Coefficient of Viscosity determination using Poiseuille's Method

UNIT-II: ACOUSTICS & ULTRASONICS: **12 Hrs**

Fundamentals of acoustics - reverberation- reverberation time - factors affecting acoustics. Ultra sonics -Production of ultra sonic waves- detection of ultra sonic waves+ - acoustic grating-application of ultra sonic waves.

Lab Component–2. Ultra sonic Velocity Determination

UNIT-III: WAVEOPTICS: **12 Hrs**

Huygen`s principle–qualitative analysis of interference of light–wavefronts plitting and amplitude–airwedge- Newton`s rings-Michels on interferometer and its applications–Spectrometer Prism–Determination of refractive index -Grating–determination of wave length–Introduction to SEM&TEM

Lab Component–3. Spectro meter–Grating **12 Hrs**

UNIT-IV: LASER:

Laser principle and characteristics - amplification of light by population inversion - properties of laser beams: mono-chromaticity, coherence, directionality and brightness-different types of lasers-Rubylaser-Nd-YAGlaser-He-Nelaser-CO_2 laser - semiconductor laser - applications of lasersinscience, engineeringand medicine.

Lab Component–4. Determination of Wave length of the given Laser source & Particle Size Determination

UNIT-V: FIBER OPTIC COMMUNICATION: **12 Hrs**

Total Internal Reflection –Propagation of Light in Optical Fibers– Numerical aperture and Acceptance Angle – Types of Optical Fibers (material, refractive index, mode) – Fiber Optical Communication system (Block diagram) – Attenuation– Transmitter, Receiver, Dispersion, Modulation/Demodulation Advantages of Fiber Optical Communication System – IMT, PMT, – Applications of opticalfiber

Lab Component–5. Determination of Numerical Aperture of Optical Fiber

Total Periods: 60

TEXT BOOKS:

1. **Brijlal, M. N. Avadhanulu& N. Subrahmanyam**, *Textbook of Optics*, S. Chand Publications, 25th Edition, 2012.
2. **R. Murugeshan**, *Electricity and Magnetism*, S. Chand Publications, 10th Edition, 2017.
3. **R. Murugeshan & Kiruthiga Sivaprasath**, *Modern Physics*, S. Chand Publications, 2016.

REFERENCE BOOKS:

1. **Dr. Senthil Kumar**, *Engineering Physics*, IVR B Publishers, 2016.
2. **N. Subrahmanyam &Brijlal**, *Waves and Oscillations*, Vikas Publications, New Delhi, 1988.
3. **N. Subrahmanyam &Brijlal**, *Properties of Matter*, S. Chand & Co., New Delhi, 1982.
4. **N. Subrahmanyam &Brijlal**, *Textbook of Optics*, S. Chand & Co., New Delhi, 1989.
5. **R. Murugeshan**, *Electricity and Magnetism*, S. Chand & Co., New Delhi, 1995.
6. **Thyagarajan, K. & Ajay Ghatak**, *Laser Theory and Applications*, Macmillan, New Delhi, 1988.
7. **Dr. S. Muthukumaran, Dr. G. Balaji, S. Masilamani**, *Physics Laboratory I & II*, Sri Krishna Hi-Tech Publishing Company Pvt. Ltd.

COURSE CODE	COURSE NAME: ENGINEERING CHEMISTRY	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBCH22ET1	Prerequisite: Higher Sec. Chemistry	ETL	2	0/0	2/0	3

C: Credits, L: Lecture, T: Tutorial, S Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/ Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES:

The students should be made to:

1. Deduce practical applications of theoretical concepts.
2. Gain insight into fundamental concepts of chemical thermodynamics.
3. Articulate the methods of water treatment.
4. Acquire knowledge in electrical conductance and EMF.
5. Develop awareness about modern nanocomposites along with concepts of polymers.
6. Get introduced to analytical tools for characterization techniques.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Apply relevant instrumentation techniques to solve complex problems
CO2	Recall the fundamental sanded monstrate by understanding the first principles of Engineering sciences.
CO3	Examine the appropriate techniques to interpret data to provide valid conclusion
CO4	Demonstrate the collaboration of science and Engineering to recognize the need for life long learning.
CO5	Analyze the impact of contextual knowledge to access the health and society issues.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3	3	3				2			
CO2	3	3				3						3
CO3	3		2	3								
CO4	3	3		3				3				3
CO5	3					2	3	2				3

COs/PSOs	PSO1	PSO2	PSO3	PSO4	
CO1	2	3			
CO2		3			
CO3	2	3			
CO4		3			
CO5		3			

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanitiesandsocial Science	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical /Project
	√								

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBCH22ET1	ENGINEERING CHEMISTRY	ETL	2	0/0	2/0	3

UNIT-I: CHEMICAL THERMO DYNAMICS: 12 Hrs

Introduction, Terminology in thermodynamics –System, Surrounding, State and Path functions, Extensive and intensive properties. Laws of thermodynamics–I and II laws-Need for the II law. Enthalpy, Entropy, Gibbs free energy, Helmholtz free energy - Spontaneity and its criteria. Maxwell relations, Gibbs -Helmholtz equation (relating E & A) and (relating H & G).

UNIT-II: TECHNOLOGY OF WATER: 12 Hrs

Water quality parameters – Definition and expression. Analysis of water – alkalinity, hardness and its determination (EDTA method only). Boiler feed water and Boiler Troubles-Scales and sludges, Caustic embrittlement, Priming and Foaming and Boiler corrosion. Water softening processes – Internal conditioning, external conditioning – Demineralizationmethods.Desalinationprocesses-RO and Electrodialysis.

Lab Component-1. Analyze the water quality parameters for the given water sample.

UNIT-III: ANALYTICAL AND CHARACTERIZATION TECHNIQUES: 12 Hrs

Chromatographic techniques – column, thin layer and paper. Instrumentation-working with block diagram- UV-Visible Spectroscopy, IR Spectroscopy, Scanning electron microscope, Transmission electron microscope.

Lab Component-2. Determination of Rf values of various components using thin layer chromatography.

3.Compute and interpret the structures of the given molecules using Chem Draw.

UNIT–IV: ELECTRO CHEMISTRY: 12 Hrs

Conductance–Types of conductance eandits Measurement.Electrodes and electrode potential, Nernstequation – EMF measurement and its applications-Electrochemical series- Types of electrodes- Reference Electrodes-Standard hydrogen electrode- Saturatedcalomelelectrode-Determination of P^H using this electrode.

Lab Component-4. Studies on acid-base conducto metrictitration.

5. Determination of redox potentials using potentiometry

UNIT-V: POLYMERS AND NANO COMPOSITES: 12 Hrs

Polymers-Introduction-Monomers–Functionality –Degreeofpolymerization-Tacticity.Classification-Plastics – Thermoplastics and thermosetting plastics, Compounding of plastics – Compression moulding, injection moulding and extrusion processes. Nano composites: particulates, clay and carbon nano tubes. Graphene nano composites and its applications.

Lab Component-6. Polymeric analysis using capillary viscometer

Total Hours: 60

References:

1. Jain&Jain*EngineeringChemistry*17thEdition, DhanpatRaiPublishingCompany
2. VasantR.Gowariker, N.V. Viswanathan, JayadevSreedhar, *PolymerScience*, NewAgeInternational,1986
3. B.K. Sharma, *PolymerChemistry*, GoelPublishingHouse
4. Y.R. Sharma, *ElementaryOrganicSpectroscopy*, S. Chand&CompanyLtd.
5. N. Krishnamurthy, K. Jeyasubramanian, P. Vallinayagam, Applied Chemistry, TataMcGraw-HillPublishing Company Limited, 1999.
6. Chichester, polymer-clay-nanocomposites, Johnwiley (2000)

COURSE CODE	COURSENAME: BASIC MECHANICAL & CIVIL ENGINEERING	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBME22ET1	Prerequisite: Nil	ETL	2	0/0	2/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/EmbeddedTheory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To understand the fundamentals and applications of IC Engines, power plants, manufacturing processes and mechanics.
- To expose the students to the various construction materials and their applications.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Demonstrate the working principles of power plants, IC Engines and boilers.
CO2	Utilize the concept to fmetals forming, joining process and apply in suitable machining process
CO3	Understand the various machining process in machine tool
CO4	Utilize the concept of Building materials and constructionable to perform concrete mix and masonry Types
CO5	Demonstrate how Roads, Railways, dams, Bridges have been constructed

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3					2		3	3	3		3
CO2	3				1	2		1	2	2		2
CO3	3	3			1	1		1	2	2		2
CO4	3				1	1			2	2		2
CO5	3				1	1		1	2	2		2

COs/PSOs	PSO1	PSO2	PSO3	PSO4	
CO1	1				
CO2					
CO3	1				
CO4			1		
CO5				2	

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanitiesandsocial Science	ProgramCore	Programelective	OpenElective	Inter Disciplinary	SkillComponent	Practical/Project
		✓							

COURSE CODE	COURSENAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBME22ET1	BASIC MECHANICAL & CIVIL ENGINEERING	ETL	2	0/0	2/0	3

UNIT-I: THERMAL ENGINEERING: 14 Hrs

Classification of internal combustion engine–Working of two strokes, four stroke petrol and diesel engines. Classification of Boilers –Cochran boiler–Locomotive boilers– Power plant classification –Working of Therma land nuclear power plant- Working of Solar-Wind - Tidal and Geothermal power plants.

Lab component: Study of Boilers and IC engines

UNIT-II: MANUFACTURING PROCESS: 14 Hrs

Metal forming processes – Rolling, forging, drawing, extrusion and sheet metal operations- fundamentals only. Metal Joiningprocesses–Welding -arc and gaswelding, Soldering and Brazing.Casting process – Patterns-Moulding tools- Types of moulding - Preparation of green sand mould -Operation of Cupola furnace.

Lab component: Sheet metal works, Fitting-Cutting (T, V, Landdove tail joints)

UNIT-III: MACHINING PROCESS: 10 Hrs

Basics of metal cutting operations – Working of lathe- parts-Operations performed. Drilling machine – Classification – Radial drilling machine - Twist drill no menclature. Milling machine-types-different operations performed.

Lab component: Lathe operation: Step turning and Taper turning, Drilling Operation-Making hole drilling

UNIT-IV: BUILDING MATERIALS AND CONSTRUCTION: 12 Hrs

Materials: Brick-Types of Bricks-Teston bricks -Cement–Types, Properties andusesof cement– Steel-Properties and its uses – Ply wood and Plastics.

Construction: Mortar – Ingredients – Uses – Plastering - Types of mortar - Preparation – Uses – Concrete – Types – Grades – Uses – Curing – Introduction to Building Components (foundation to roof) – Masonry – Types of masonry (Bricks & Stones)

Lab component: Carpentry: Joints (Teehalving, CrossLap, DovetailJoint) Plumbingworks-Pipeconnections

UNIT-V: ROADS, RAILWAYS, BRIDGES & DAMS: 10 Hrs

Roads – Classification of roads –Components in roads – Railways -Components of permanent way and their function – Bridges – Components of bridges – Dams – Purposeof dams – Types of dams.

Total Hours: 60

TEXT BOOKS:

1. S. Bhaskar, S. Sellappan, H.N. Sreekanth, (2002), "*BasicEngineering*"–Hi-TechPublications
2. K. Venugopal, V. PrabhuRaja, (2013-14), "*BasicMechanicalEngineering*", AnuradhaPublications.
3. K.V. Natarajan (2000), *BasicCivilEngineering*, DhanalakshmiPublishers
4. S.C. Sharma (2002), *BasicCivilEngineering*, DhanpatRajPublications

REFERENCES:

1. *PR.SL.Somasundaram, (2002), "BasicMechanicalEngineering"–, VikasPublications.*
2. *S.C. Rangawala (2002), BuildingMaterialandConstruction, S. ChandPublisher*

COURSE CODE EBCS22ET1	COURSENAME: C PROGRAMMING AND MS OFFICE TOOLS	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
	Prerequisite: Nil	ETL	1	0/0	2/0	2

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/EmbeddedTheory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to

- Learn a programming language.
- Learn problem solving techniques.
- Write programs in C and to solve the problems.
- Familiarize the students inpreparation of documents and presentations with office automation tools.

COURSE OUTCOMES(COs): Students will be able to

CO1	Understand and trace the execution of programs written in C language.
CO2	Write the C code for a given algorithm.
CO3	Apply Arrays and Functions concepts to write Programs
CO4	Apply Structures and pointers concepts for writing Programs
CO5	Toper for m documentation, accounting operations and presentation skills

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1	1	1	1	1	1	2	2
CO2	2	2	2	2	1	1	1	1	1	1	2	2
CO3	2	2	3	2	1	1	1	1	1	1	3	2
CO4	2	2	3	3	1	1	1	1	1	1	3	2
CO5	1	1	1	1	1	1			2	3	2	

COs/PSOs	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	2	1	
CO2	3	3	2	1	
CO3	3	3	2	1	
CO4	3	2	2	1	
CO5	2	2	0	0	

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanitiesand social Science	ProgramCore	Program elective	OpenElective	InterDisciplinary	SkillComponent	Practical/Project			
				✓								

COURSE CODE	COURSENAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBCS22ET1	C PROGRAMMING AND MS OFFICE TOOLS	ETL	1	0/0	2/0	2

UNIT-I: Introduction: **3 Hrs**

BasicStructureofCprogramme-Constants, Variables and datatypes, Keywords, Identifiers-Operators and expressions-executing a C Program

UNIT-II: Decision making statements and looping statements: **3 Hrs**

Decision making with if statement, Simple if statement, else-if statement, Nesting if-else statement, the else if ladder, the switch statement, Thegoto statement, the while statement, the do while statement, the for statement, jumps in loops

UNIT-III: Arrays and Functions: **3 Hrs**

Introduction to Arrays- One dimensional arrays, two-dimensional array, and Multidimensional array- Introduction to Functions- calling a function, category of functions- arguments with return values, argument with no return values-parameter passing Mechanism: Call by Value and Call by Reference. Recursion.

UNIT-IV: Structures & Pointers: **3 Hrs**

Structures definition, giving values to members, Structure initialization, comparison of structure variables, Structure within structures, understanding pointers, accessing the address of the variable, declaring and initializing pointer, accessing a variable through its pointer and arrays

UNIT-V: Ms-Office: **3 Hrs**

Introduction to MS-Word- Menus- Introduction to MS-Excel: features of MS- Excel, spread sheet/worksheet, parts of MS-excel window, functions in excel sheet, chart, Introduction to MS-Powerpoint

Total Hours:15

TEXT BOOKS:

1. E. Balaguruswamy, ProgramminginANSIC
2. PadmaReddy, ComputerConcepts& 'C'Programming
3. ShobhaHangirke, ComputerApplicationForBusiness

List of Experiments: C PROGRAMMING **30 Hrs**

1. Find the factorial of a given positive number using function.
2. Calculate X raised to y using function.
3. Find GCD and LCM of two given integer numbers using function.
4. Find the sum of N natural numbers using function.
5. Book information using Structure.
6. Student information using Structure.
7. Print the address of a variable and its value using Pointer
8. Find area and perimeter of a circle
9. Check whether the given number is palindrome or not
10. Check whether the given number is prime or not
11. Calculate sumof the digits of the given number
12. Display Fibonacci series upto N terms
13. Check whether a given characteris alphabetic, numeric or special character
14. Count vowels and consonants in a given string
15. Find product of two matrices

MS-OFFICE:

16. Preparing a news letter:
17. To prepare a newsletter with borders, two columns text, header and footer and inserting a graphic image and page layout.
18. Creating and editing the table
19. Printing envelopes and mail merge.
20. Using formulas and functions: To prepare a Work sheet showing the monthly sales of accompany in different branch offices
21. Prepare a Statement for displaying Result of 10 students in 5 subjects

Total Hours:45

COURSE CODE	COURSENAME: ORIENTATION TO ENTREPRENEURSHIP & PROJECT LAB	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBCC22I01	**Prerequisite: Nil**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to:

- Understand how entrepreneurship Education transforms individuals into successful leaders.
- Identify individual potential & Shave career dreams
- Understand difference between ideas & opportunities
- Identify components &create action plan.
- Use brains torming in a group to generate ideas.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Develop a business plan & improve ability to recognize business opportunity
CO2	Doaself-analysistobuildanentrepreneurialcareer.
CO3	Articulatean effective elevator pitch.
CO4	Analyze the local market environment & demonstrate the ability to find an attractive Market
CO5	Identify there quired skills for entrepreneurship & develop

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	2	3	2	2	2		2	2	2	1
CO2	3	2		3	2	3	2	3	3	3	2	2
CO3		2	2	2		3		3	3	3		
CO4		3	2	2	2	2		3	2	2	3	
CO5		2	2	3	2	2	3	3	2	2	3	1

COs/PSOs	PSO1	PSO2	PSO3	PSO4	
CO1		1		2	
CO2		1		1	
CO3		1		2	
CO4		2	1	2	
CO5				1	

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanitiesand social Science	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical /Project
							√		

COURSE CODE	COURSENAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBCC22I01	ORIENTATION TO ENTREPRENEURSHIP &PROJECT LAB	IE	1	0/0	1/0	1

UNIT-I: CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR: 3 Hrs

Introduction to entrepreneurship education–Myths about entrepreneurship–How has entrepreneurship changed the country–Dreamit.Doit-Ideaplanes-Some success stories–Global Legends–Identify your own heroes.

UNIT-II: ENTREPRENEURIAL STYLE: 3 Hrs

Entrepreneurial styles – Introduction, concept & Different types - Barrier to Communication – Body language speaks louder than words

UNIT-III: DESIGN THINKING: 3 Hrs

Introduction to Design thinking – Myth busters – Design thinking Process - Customer profiling – Wowing your customer–Personal selling–concept&process–show&tell concept–Introduction to the concept of Elevator Pitch

UNIT-IV: RISK MANAGEMENT: 3 Hrs

Introduction to risk taking & Resilience–Managing risks (Learning from failures, Myth Buster)– Understanding risks through risk takers – Why do I do? – what do I do?

UNIT-V: PROJECT: 3 Hrs

How to choose atopic–basics kill sets necessary to take up a project–creating a proto type–Pitch your project – Project presentation.

IDEAGENERATION, EVALUATION & PROJECT PRESENTATION: 15 Hrs

Total Hours: 30

Reference Books & Website:

1. Encyclopedia of Small Business(2011)–(ebook)
2. Oxford Handbook of Entrepreneurship(2014)–(ebook)
3. lms.learnwise.org

SEMESTER–II

COURSE CODE	COURSENAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBMA24001	**OPTIMIZATION TECHNIQUES FOR ARTIFICIAL INTELLIGENCE**	Ty	3	1/0	0/0	4

OBJECTIVES:

The students should be made to

- Formulate, analyze and solve optimization problems with Simplex algorithm in Linear Programming.
- Create network paths, analyze and solve them with Critical Path Methods.
- Understand the single and multi-server Queues, zero sum Games

COURSE OUTCOMES(Cos): Students will be able to

CO1	Formulate the Linear programing problem and solve it with simplex algorithm
CO2	Understand the concepts of Transportation and Assignment problems under Linear Programming
CO3	Create networks for scheduling problems and solve it with CPM and PERT methods.
CO4	Understand the concepts of Single and Multi-server models in Queuing theory
CO5	Solve the problems in Zero sum games

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	1	2	1	2	2
CO2	3	3	2	2	1	1	1	1	2	1	2	2
CO3	3	3	2	2	1	1	1	1	2	1	2	2
CO4	3	3	2	2	1	1	1	1	2	1	2	2
CO5	3	3	2	2	1	1	1	1	2	1	2	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4	
CO1	3	3		1	
CO2	3	2		1	
CO3	3	3		1	
CO4	3	3		1	
CO5	3	3		1	

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanities and social Science	ProgramCore	Program	OpenElective	Inter Disciplinary	Skill Component	Practical /Project
	√								

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBMA24001	OPTIMIZATION TECHNIQUES FOR ARTIFICIAL INTELLIGENCE	Ty	3	1/0	0/0	4

UNIT-I: LINEAR PROGRAMMING: 12 hrs

Formulation of LPP – Standard form of LPP – Graphical method – Simplex method – Big M method – Two phase method.

UNIT-II: TRANSPORTATION AND ASSIGNMENT: 12 hrs

Formulation of Transportation problem – North West corner method – Least cost method – Vogel's approximation method – Optimality test – MODI method – Degeneracy – Assignment problem: Hungarian method – Travelling salesman problem.

UNIT-III: CPM, PERT: 12 hrs

Network representation – Fulkerson's rule – Critical path method – Scheduling of activities – Earliest and Latest times – Float and Slack times – PERT – Probability for project duration –

UNIT-IV: QUEUINGMODELS: 12 hrs

Elementary concepts – Pure Birth and Death process – Single server Markovian models with infinite and finite capacity – Multi server Markovian models with infinite and finite capacity.

UNIT-V: GAME THE ORY: 12 hrs

Introduction – Two-person Zero Sum game – Maximin-Minimax principle – Saddle point – Game without Saddle point (2X 2Gameonly)–Dominanceproperty –Graphicalmethod (2X n and mX2games only).

Total Hours: 60

Text Book:

1. C.Mohan, KusumDeep, OptimizationTechniques, NewAgeinternationalPublishers,1st Edition2009.
2. SingiresuS.Rao, EngineeringOptimization: TheoryAndPractice, WilyPublishers,2019

Reference Books:

1) HamdyA.Taha, *OperationsResearch: AnIntroduction(10th ed.)*, Pearson, (2017).
2) L.R. Foulds, OptimizationTechniquesAnIntroduction, Springer–Verlag,2012

COURSE CODE	COURSE NAME: SOLID STATE PHYSICS	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBPH24001	**Prerequisite: Engg.Physics**	Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

- Design, conduct experiment and analyze data.
- Develop a Scientific attitude at micro and nanoscale of materials
- Understand the concepts of Modern Physics
- Apply the science of materials to Engineering &Technology

COURSE OUTCOMES(Cos):
Students completing this course were able to

CO1	Enable the student to employ the classical &quantum the ories &Lawsin general
CO2	Critically evaluate to build models to understand the solid-state fundamentals
CO3	Formulate & understand the behaviour of solid-state devices
CO4	Articulate the physical properties of condensed matter
CO5	Interpret the role of solid-state physics in the advanced technological developments

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3				1							
CO3	3		2	3								
CO4	3									1		
CO5	3			3		2	1	2				2

3/2/1IndicatesStrengthOfCorrelation,3–High,2-Medium,1-Low:

Category	BasicSciences	Engg.Science	Humanities& social Science	Program Core	ProgramElective	OpenElective	Practical/Project	Internships/TechnicalSkills	SoftSkills
	√								

COURSE CODE	COURSE NAME: SOLID STATE PHYSICS	Ty/ Lb / ETL/IE	L	T/SLr	P/R	C
EBPH24001	**Prerequisite: Engg.Physics**	Ty	3	0/0	0/0	3

UNIT-I: CRYSTALLOGRAPHY: **9 Hrs**

Space Lattice–Unit cell–Bravais lattice–Lattice planes–Miller indices–Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond & NaCl Structures– Symmetry – Absence of fivefold symmetry in crystals

UNIT-II: CONDUCTORS & SUPER CONDUCTORS: **9 Hrs**

Conductors–Introduction-Qualitative analysis of Free electron theory–Electrical & Thermal Conductivity (Derivation) -Fermienergy&itsimportance–Qualitative analysis of conductors, semiconductors & insulators–Importante lectrical materials

Super conductors – Transition temperature – BCS theory – Properties of super conductors – Types – Low & High temperature superconductors – AC & DC Josephson effect – SQUIDS, Magnetic Levitation – Applications of super conductors

UNIT-III: SEMI CONDUCTORS: **9 Hrs**

Introduction – Types – Importance of germanium & silicon – Intrinsic semiconductors – electron & hole density in intrinsic semiconductors – Hall effect – Determination of Hall coefficient & applications – Introduction to diodes – characteristics of Zenerdiode– Introduction to transistors– characteristics of transistor in CE configuration.

UNIT-IV: MAGNETISM & DIELECTRICS: **9 Hrs**

Magnetism: Introduction-Types–Comparison of Dia, Para and Ferro Magnetism–Heisenberg's interpretation–Domain theory–Hysteresis–Soft and Hard Magnetic Materials–Magnetic Resonance Imaging. &other applications Dielectrics: Electrical Susceptibility – Dielectric Constant – Concept of Polarization – Frequency and Temperature Dependence of Polarization –Di electric loss–Di electric break down –Practical Applications of Di electric materials

UNIT-V: OP TO ELECTRONICS: **9 Hrs**

Properties & Classification of Optical Materials – Absorption in Metals, Insulators & Semiconductors – Composite Materials–NanoMaterials–BioMaterials–MEMS–NEMS–LED's–OrganicLED's–LCD's–CarbonNanotubes– Applications of various types of optical semiconductors

Total Hours: 45

TEXT BOOKS & REFERENCE BOOKS:

1. V.Rajendran&Mariakani "MaterialsScience", TataMcGrawHill (2004).

2. P.K. Palanisamy, "Materialsscience", ScitechPublication (2002).

3. Dr. SenthilKumar, "EngineeringPhysicsII" VRBPublishers (2016).

4. V.Arumugam, MaterialsScience", AnuradhaAgencies, (2003Edition).

5. PillaiS.O., "SolidState Physics", NewAgeInternational, (2005)

COURSE CODE	COURSE NAME: TECHNICAL CHEMISTRY	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBCH22001	Prerequisite: Engg.Chemistry	Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

1. To identify the application of semi conductors in optics and solar cells.
2. To analyze the radical improvement in electrical energy storage devices.
3. To understand the degradation of electrical fittings and metallic joints.
4. To solve chemical problems by simulation.
5. To differentiate the various engineering materials by understanding its properties**.**

COURSE OUTCOMES(Cos): Students will be able to

CO1	Paraphrase the engineering knowledge by identifying proper chemical science technique.
CO2	Interpret appropriate solution for complex problems by using modern engineering and IT tools.
CO3	Retrieve and show the design solutions for safety and sustainable development.
CO4	Integrate the electrical and electronic concepts with professional ethics.
CO5	Articulate the technological changes recognizing the need for life long learning.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		2		3							
CO2	3		3	3	3							
CO3	3		3	3			3	2				
CO4	3							3				3
CO5	3		3				3					2

COs/PSOs	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	2		
CO2	3	3	2		
CO3	3	3	2		
CO4	3	3	2		
CO5	3	3	2		

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
	√								

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBCH22001	TECHNICAL CHEMISTRY	Ty	3	0/0	0/0	3

UNIT–1: CHEMISTRY OF SEMI CONDUCTORS: 9 Hrs

Semi conductors – Introduction – holes and electrons-Band theory-properties of semi conductors-Types of semi conductors-Intrinsic-Extrensic semi conductors-Mobility of electron sand Holes-Fermilevel in Semi conductors-Industrial application of Semi Conductors-Semi conductors in Optics - LEDs, OLEDs, Semi conductors in solar cells-Types - First generation solar cells - Single crystalline and poly crystalline solar cells -Czochralski Process of single crystalline silicon synthesis

UNIT-2: ELECTRO CHEMICAL CELLS AND BATTERY TECHNOLOGY: 9 Hrs

Electro chemical cells: Galvaniccell (Danielcell); Batteries: Classification of batteries, primary batteries (drycells)and secondary batteries-nickel-cadmium, lead-acidbattery, Solid state batteries–Lithium battery, Lithium Sulphur battery, Fuel cells.

UNIT-3: DEVICE CORROSION: 9 Hrs

Introduction–chemistry of IC and PCB-causes of corrosionon IC, PC-miniaturization, complex material utilization, production and service factors–environmental contamination (airborne contaminants)-Forms of corrosion–anodic, cathodic corrosion-Electrical Contact and metallic joints degradation-fretting corrosion-corrosion costs–corrosion protection of computer hardware.

UNIT-4: COMPUTATIONAL CHEMISTRY: 9 Hrs

Introduction, Software tools available for chemistry and its applications, Chem Draw- Designing a Chemical Structure-Shortcuts and Hotkeys on designing a chemical structure, Biopolymer Drawing, Advanced drawing Techniques.Structure Analysis, creating 3D Models, Estimating and displaying Proton and carbon-13 NMR chemical shifts, Creating TLC Plates to find Rf values, Chem Draw/Excel functions.

UNIT-5: MODERN ENGINEERING MATERIALS FOR ELECTRONIC DEVICES: 9 Hrs

Alloys and Need for Alloys - Modern Electronic grade alloys-Applications in electrical components, transducers, electromagnetic shielding of computers, telecommunications equipment and rocket motor casings. Thin films-Preparation by the Sol-Gel Method-Application of thin films.

Total Hours:45

References:

1. Oleg Roussak & H. D. Gesser, *Applied Chemistry*: A Textbook for Engineers and Technologists, Springer.
2. Samue lGlasstone, *An Introduction of Electrochemistry*, Franklin Classics Trade Press.
3. KhartonV.V, *Solid state electro chemistry II*: Electrodes, interfaces and ceramic membranes, Wiley
4. JainandJain, *Engineering Chemistry*, Dhanpat Rai Publishing Company.
5. *Chemdraw16.0 User Guide*, Perkin Elmer Informatics Inc.
6. RolfE.Hummel, *Electronic Properties of Materials*, Springer

COURSE CODE	COURSE NAME: ENGINEERING GRAPHICS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBME22001	Prerequisite: Nil	Ty	2	0/0	2/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To acquire knowledge in geometrical drawing.
- To expose the students in computer aided drafting**.**

COURSE OUTCOMES(Cos): Students will be able to

CO1	Utilize the concept of Engineering Graphics Techniques to draft letters, Numbers, Dimensioning in Indian Standards
CO2	Demonstrate the drafting practice visualization and projection skills use ful for conveying ideas in engineering applications.
CO3	Identify basic sketching techniques of engineering equipments
CO4	Demonstrate the projections of Points, Lines, Planes and Solids. And
CO5	Draw the sectional view of simple building drawing.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	2			3	3		3
CO2	3	3	3	2	2	2			3	3		3
CO3	3	3	3	1		2			2	2		2
CO4	3	3	2	2		3		2	3	3		3
CO5	3	3	3	2	3	1		2	3	3		3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1			1	
CO2	1			
CO3			1	
CO4		1		
CO5				

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanitiesandsocial Science	Program Core	Program elective	OpenElective	Inter Disciplinary	SkillComponent	Practical/Project
		√							

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBME22001	ENGINEERING GRAPHICS	Ty	2	0/0	2/0	3

CONCEPTS AND CONVENTIONS (Not for examination): 5 Hrs

Introduction to drawing, importance and areas of applications–BIS standards–IS:10711–2001:Technical products Documentation–Size and layout of drawing sheets–IS9606–2001:Technical products Documentation–Lettering–IS10714&SP46–2003:Dimensioning of Technical Drawings–IS:15021– 2001:Technical drawings–Projections Methods–drawing Instruments, Lettering Practice–Line types and dimensioning–Border lines,lines title blocks Construction of polygons–conic sections–Ellipse,Parabola, Hyperbola and cycloids.

UNIT-I: PROJECTION OF POINTS, LINES AND PLANE SURFACES: 12 Hrs

Projection of points and straight lines located in the first quadrant–Determination of true lengths and true inclinations – projection of polygonal surface and circular lamina insimple position only.

UNIT-II: PROJECTION OF SOLIDS: 10 Hrs

Projection of simple solids like prism, pyramid, cylinder and cone in simple position

Sectioning of abovesolids in simple vertical position by cutting plane inclined to any one of the reference planes and perpendicular to the other.

UNIT-III: DEVELOPMMENT OF SURFACES: 9 Hrs

Development of lateral surfaces of simple and truncated solids–prisms, pyramids, cylinders, andcones.

UNIT-IV: ISOMETRIC PROJECTION: 9 Hrs

Principles of isometric projection–isometric scale–isometric projections of simple solids, like prisms pyramids, cylinders and cones.

UNIT-V: ORTHO GRAPHICS PROJECTIONS: 8 Hrs

Ortho graphic projection of simple machine parts–missing views

BUILDING DRAWING: 7 Hrs

Building components–front, Top and sectional view of a security shed.

(Basic Auto CAD commands to be taught-not for Examinations)

Total Hours:60

Note: First angle projection to be followed.

TEXT BOOKS:

1. Bhatt, N.D. andPanchal, V.M. (2014) Engineering Drawing Charotar Publishing House
2. Gopalakrishnan, K.R. (2014) Engineering Drawing (Vol.I&IICombined) Subhas Stores, Bangalore.
3. Natrajan K.V., “A TextBook of Engineering Graphics”, Dhanalakshmi Publishers, Chennai,2018.
4. VenugopalK.andPrabhuRajaV., “EngineeringGraphics”, NewAgeInternational(P)Limited,2008.

COURSE CODE EBCS24001	COURSE NAME: FUNDAMENTALS OF COMPUTER ENGINEERING	Ty/Lb/ ETL/I E	L	T/ S. Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The student should be made to

- To learn the major components of a computer system
- Know the correct and efficient ways of solving problems
- Provide a fundamental knowledge of Computer Engineering

COURSE OUTCOMES(COs): After Completing the course, the student can be able to

CO1	Demonstrate the knowledge of the basic structure, components, features and generations Of computers.
CO2	Understand the concept of computer languages, language translators and construct Algorithms to solve problems using programming concepts.
CO3	Compare and contrast features, functioning & types of operating system and computer networks.
CO4	Demonstrate architecture, functioning & services of the Internet and basics of multimedia.
CO5	Apply the emerging trend sand technologies in the field of Information Technology.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	1	0	0	0	1	0	1	0
CO2	2	1	1	2	1	0	0	0	1	0	0	0
CO3	2	2	1	2	1	0	0	0	1	0	0	0
CO4	1	2	1	2	1	0	0	0	1	0	1	1
CO5	1	1	1	2	0	0	0	0	1	0	1	1

COs/ PSOs	PSO1	PSO2	PSO3	PSO4
CO1	0	0	0	0
CO2	0	0	0	0
CO3	1	0	0	0
CO4	0	1	1	0
CO5	1	1	1	0

3/2/1Indicates Strength of Correlation, 3–High,2-Medium,1-Low:

Category	Basic	Engineering Sciences	Humanities andSocial	Program Core	Program Electives	Open Electives	Practical/ Project	Internships/	SoftSkills			
				✓								

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBCS24001	FUNDAMENTALS OF COMPUTER ENGINEERING	Ty	3	0/0	0/0	3

UNIT-I: INTRODUCTION TO COMPUTERS: 9 Hrs

Role of Computer in Current ERA–Block diagram of Computer, Processing Data-Basic Computer organization -Characteristics of Computers–Evolution of Computers–Computer Generations–Classification of Computers – Computer System Memory hierarchy — Number Systems.

UNIT-II: COMPUTER SOFTWARE & HARDWARE: 9 Hrs

Basic Operations-Computer Software & Hardware–Input and Output Devices-Types of Software– Introduction to ALU- Hardware Components-Optical drive- compiler-interpreter- Assembler- Processor and Memory- Disk scheduling and partitioning- Trouble shooting- opensource- Scripting languages

UNIT-III: PROBLEM SOLVING AND OS BASICS: 9 Hrs

Planning the Computer Program – Purpose – – Identification of Computational Problems -Algorithm - Building blocks of algorithms (statements, state, control flow, functions) – Flowcharts – Need for logical thinking– Problem formulation and development of simple programs–simplestrategies for developing algorithms (iteration, recursion)-Pseudo code–System Software-Application Software–Operating system structure–operating system services-Virtual Machines

UNIT-IV: INTERNET: 9 Hrs

Overview, Types of Networks (LAN, WAN and MAN), Data communication, topologies, Routers, Switches, Hub, Repeater, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopheretc., Search engines, E- mail, Web Browsers.InternetofThings(IoT): Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things- Virus-Malware.

UNIT-V: EMERGING TECHNOLOGIES IN COMPUTING: 9 Hrs

Overview - Artificial Intelligence - Machine Learning, Deep Learning -Grid computing- Edge computing – Green computing- big data analytics- Quantum Computing and Brain Computer Interface- IoT in Agriculture- Image processing in medical field- 6G-Augmented Reality- Virtual Reality- Cyber Security-Block chain.

Total Hours: 45

TEXTBOOKS:

1. Pradeep K. Sinha and PritiSinha, Computer Fundamentals, Third Edition, BPB Publications, New Delhi, 2003.
2. Carl Reynolds and Paul Tymann, Principles of Computer Science, Schaum's Outline Series, McGraw Hill, New Delhi, 2008.
3. Sanjay Silakari and RajeshK.Shukla, Basic Computer Engineering, WileyIndia,2011.

REFERENCE:

1. BhanuPratap, Computer Fundamentals, Cyber Tech Publications, New Delhi,2011.

COURSE CODE	COURSE NAME: COMMUNICATIVE ENGLISH LAB	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBCC22I02	Prerequisite: Pass in Plus2 English	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To engage students in meaning ful oral English communication and organized academic and professional reading and writing for a successful career.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Engage in meaningful oral communication in English with writing as a scaffolding activity.
CO2	Haveanin-depth under standing of the components of English language and its use inoral communication.
CO3	Strengthen their vocabulary and syntactic knowledge for use in academic and technical communication
CO4	Learn to negotiate meaning in inter-personal and academic communication for a successful career.
CO5	Engage inorganized academic and professional writing for life-long learning and research

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		1	1	3	2	1	1	3	3		3
CO2	2	1	1	1	3	3	1	2	3	3	1	2
CO3	1	1	1	1	2	1		2	3	3	1	3
CO4	1			2	3	1	2	1	2	2		3
CO5		1	1	2	3	1	1		3	1	1	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1			
CO2	1			
CO3	1	1		
CO4				
CO5			1	

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanitiesand social Science	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical /Project
			√						

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBCC22I02	COMMUNICATIVE ENGLISH LAB	IE	1	0/0	1/0	1

Unit-I: Listening: **6 Hrs**

Authentic audios and videos

Prescribed Book: English Pronunciation in use–Mark Hancock,

Unit-II: Speaking: **6 Hrs**

Individual-Solo: Self introduction, Describing, anchoring, welcome address, vote of thanks,

Pair & Group: Role play- formal -informal, narrating stories, film review, analyzing newspaper headings andreports, interpreting Advertisement pamphlets

Group discussion, mock interviews, formal presentation, power point presentation

Prescribed Book: J.C. Richards with J. Hull& S. Proctor, Interchange, CambridgeUniversityPress,2015.

Unit-III: Reading: **6 Hrs**

Extensive, focused reading, Strategies for effective reading - Reading comprehensions – Note making-summarizing- paraphrasing, Review

Suggested reading: Short stories, newspaper reports, film reviews

Unit-IV: Writing: **6 Hrs**

Extensive writing practices – note taking, Cognitive and metacognitive strategies to inculcate a sense oforganising ideas into coherent sentences and paragraphs, Formal letters, Business letters. Resume with coveringletter

Unit-V: Non verbal communication/charts, diagrams and table: **6 Hrs**

Interpretation of charts Flowchart, piechart, bar diagram, table, tree diagram, etc.,

Total Hours:30

Text Book:

1. J.C. Richards with J. Hull&S. Proctor, Interchange, Level2, Cambridge University Press,2021.
2. M.Chandrasena Rajeswaran &R. Pushkala, English-Communication LabWork book

Reference Book:

1. Hancock, Mark, English Pronunciation in Use; Cambridge Univ.Press,2013
2. Dutt, K, Rajeevan, G& Prakash, CLN 2008, *A Course on Communication Skills,*1st edn, Cambridge University Press, Chennai

COURSE CODE EBML24ET1	COURSE NAME: PROBLEM SOLVING USING PYTHON	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/ R	C
	Prerequisite: Nil	ETL	1	0/0	2/0	2

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to
•

COURSE OUTCOMES(COs): Students will be able to

CO1	Understand the fundamental concepts of computers, algorithms, flow charts and problem solving Techniques
CO2	To understand the basics of algorithmic problem solving.
CO3	To Analyze the given problem, use appropriate Strategies for problem solving
CO4	To read and write simple Python programs.
CO5	To use Python data structures–lists, tuples, dictionarie store present complex data.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	1				1		1	3
CO2	3	2	3	2	1				1			
CO3	3	2	3	2	1				1			
CO4	3	2	1	2	1				1		1	1
CO5	3	2	2	2	2				1		1	1

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1
CO2	2	2		
CO3	3	3		
CO4	2	3		
CO5	2	3		

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Science	EngineerinSCience	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinar	Skill Componen	Practical /Project			
				✓								

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBML24ET1	PROBLEM SOLVING USING PYTHON	ETL	1	0/0	2/0	2

UNIT-1: ALGORITHMIC PROBLEM SOLVING: 7 hrs

Introduction-Definition and Characteristics, Procedure (steps involved in problem solving), Algorithm, Notation of algorithms, Flow chart, A symbols used in flow charts, Pseudocode.

UNIT-2: FUNDAMENTAL ALGORITHMS: 11 hrs

Introduction: Representation of Algorithms using Programming Languages, Algorithmic problem solving, Simple Strategies for developing algorithms, Programs–Requirements for solving problems by computer– The problem-solving aspect: Problem definition phase, Getting started on a problem, The use of specific examples, Similarities among problems, Working backwards from the solution – General problem-solving strategies - Problem solving using top-down design – Implementation of algorithms, ProgramVerification, The Efficiency of Algorithms, The Analysis of Algorithms, The concept of Recursion.

UNIT-3: STRATEGIES FOR PROBLEM SOLVING: 9 hrs

Recursion versus Iteration, Asymptotic Notation, Complexity Exchanging the values of two variables, Minimum in a List, summation of a set of numbers, Tower of Hanoi, Factorial Computation, Finding the square root of a number, Generation of Pseudo random numbers, Array Order Reversal, Finding the maximum number in a set, Removal of duplicates from an ordered array.

UNIT-4: INRODUCTION TO PYTHON: 9 hrs

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate thevalues of n variables, distance between two points.

UNIT-5: LISTS, TUPLES, DICTIONARIES: 9 hrs

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing- list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

Total Hours:45

List of Experiments: PYTHON PROGRAMMING

1. Write a program to exchange the values of two variables using both a temporary variable and without a temporary variable.
2. Write a program to rotate the values in a list of n elements by one position to the right.
3. Write a program to calculate the distance between two points (x1, y1) and (x2, y2) using the distance formula.
4. Write a program to demonstrate the precedence of operators in a mathematical expression like 3+5×2−8/4.
5. Write a program to performs licing on a list to extract:
    - The first three elements.
    - The last three elements.
    - Every second element.
6. Write a program to assign multiple values to multiple variables using tuple unpacking. For example, a, b, c = 1, 2, 3.
7. Write a program to add a key-value pair to a dictionary, update an existing value, and delete a key.
8. Write a program to sort a list of number sin both ascending and descending order.
9. Write a program to create a new list using list comprehension that contains:
    - The squares of numbers from 1 to 10.
    - All even numbers from a given list.
10. Write a program to calculate the frequency of each element in a list and representitasa dictionary.

Text Book:

1. How to Solve it by Computer, R.G. Dromey,25th Edition,2023, Pearson.
2. Python Programming using Problem solving, H. Bhasin,2023, Mercury Learning and Information

Reference Book:

1. Paul Deitel and Harvey Deitel, “PythonforProgrammers”, Pearson Education,1st Edition,2021.
2. Martin C. Brown, “Python: The Complete Reference”,4th Edition, Mc-GrawHill,2018.

COURSE CODE: EBCC22I03	COURSE NAME: ENVIRONMENTAL SCIENCE (AUDIT COURSE)	Ty/Lb/ ETL/IE	L	T/S. Lr	P/ R	C
	Prerequisite: Nil	IE	1	0/0	1/0	0

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To acquire knowledge of the Environment and Ecosystem & Biodiversity
- To acquire knowledge of the different types of Environmental pollution
- To know more about Natural Resources
- To gain understanding of social issues and the Environment
- To attain familiarity of human population and Environment

COURSE OUTCOMES(COs): Students will be able to

CO1	Know about Environment and Ecosystem & Biodiversity
CO2	Comprehendair, water, Soil, Marine, Noise, Thermal and Nuclear Pollutions and Solid Waste management and identify the importance of natural resources like forest, water, and food Resources
CO3	Discover water conservation and water shed management
CO4	Identify its problems and concerns climate change, global warming, acidrain, ozone layer depletion etc.,
CO5	Explain family welfare programmes and role of information technology in human health and environment

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1						2	3	2				1	
CO2						2	3			2		1	
CO3						2	3	2				1	
CO4						2	3	2		2		1	
CO5						2	3			2		1	

H/M/Lindicates strength of correlation H–High, M–Medium, L–Low:

Category	BasicScience	Engineering Science	Humanities and social Science	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical /Project	
			√							

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCC22I03	ENVIRONMENTAL SCIENCE (AUDIT COURSE)	IE	1	0/0	1/0	0

UNIT-I: ENVIRONMENT AND ECO SYSTEM: **3 Hrs**

Definition, Scope and Importance of environment – need for public awareness – concept, structure and function of an ecosystem- producers, consumers and decomposers – energy flow in the ecosystem. Bio diversity at national and local levels – India

UNIT-II: ENVIRONMENT POLLUTION: **3 Hrs**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e)Noise pollution (f)Nuclear hazards(g)E-Wastes and causes, effects and control measures

UNIT-III: NATURAL RESOURCES: **3 Hrs**

Forest resources: Use and over-exploitation, deforestation. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts overwater, dams-benefits and problems. Food resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizer-pesticide problems.

UNIT-IV: SOCIAL ISSUES AND THE ENVIRONMENT: **3 Hrs**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, water shed management–resettlement and rehabilitation of people; its problems and concerns climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, central and state pollution control boards- Public awareness.

UNIT-V: HUMAN POPULATION AND THE ENVIRONMENT: **3 Hrs**

Population growth, variation among nations – population explosion, environment and human health – human rights – value education – HIV/AIDS – women and child welfare – role of information technology in environment and human health

(A) AWARENESS ACTIVITIES: **15 Hrs**

i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
ii) Slogan making event
iii) Poster making event
iv) Cyclerally
v) Lectures from experts

(B) ACTUAL ACTIVITIES:

i) Plantation
ii) Gifting a tree to see its full growth
iii) Cleanliness drive
iv) Drive for segregation of waste
v) To lives omebig environment a list for a week or so to understand his work
vi) To work in kitchen garden for mess
vii) To know about the different varieties of plants
viii) Shutting down the fans and ACs of the campus for an hour or so **Total Hours: 30**

TEXT BOOKS:

1. GilbertM. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. BennyJoseph, 'Environmental Science and Engineering', Tata Mc Graw Hill, New Delhi, (2006).

REFERENCES:

1. *Vairamani, S. and Dr.K. Sankaran.* ***Elements of Environmental and Health Science.*** *Karaikudi: KPSV Publications, 5th Edition, July 2013.*
2. *Ifthikarudeen, Etal,* ***Environmental Studies****, Sooraj Publications,2005.*
3. *R. Murugesan,* ***Environmental Studies,*** *Millennium Publishers and Distributors,2nd Edition, July,2009.*

COURSE CODE: EBFL23IXX	COURSE NAME: FOREIGN LANGUAGE - I	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: Nil	IE	1	0/0	1/0	1

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE:

The students should be made to

- To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakers of that language.

COURSE OUTCOMES (COs): Students will be able to

CO1	Achieve functional proficiency in listening, speaking, reading, and writing.
CO2	Develop an insight into the nature of language itself, the process of language and culture acquisition.
CO3	Decode, analyze, and interpret authentic texts of different genres.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	3	1	3	2	3	3	1
CO2	2	1	1	1	1	3	1	3	3	3	3	1
CO3	1	1	2	2	1	3	2	3	2	3	3	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1
CO2	1	1	1	1
CO3	1	2	2	1

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
			✓									

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBFL23IXX	FOREIGN LANGUAGE - I	IE	1	0/0	1/0	1

OBJECTIVE:

To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakersof that language

DESCRIPTION:

Foreign language is introduced in the curriculum to make the students globally employable. Students should select and register for any one of the foreign languages from the given list. At the end of the course students should be able to read, write and converse the language in the basic level. At the end of the semester the assessment will be done through internal examination by the examinerduly appointed by the head of the department.

S.NO	COURSE CODE	COURSE NAME
1	EBFL23I01	FRENCH-I
2	EBFL23I02	GERMAN-I
3	EBFL23I03	JAPANESH-I
4	EBFL23I04	ARABIC-I
5	EBFL23I05	CHINESE-I
6	EBFL23I06	RUSSIAN-I
7	EBFL23I07	SPANISH-I

Total Hours:30

SEMESTER III

COURSE CODE	COURSE NAME	LINEAR ALGEBRA AND DISCRETE MATHEMATICS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBMA24002	Prerequisite: MATHAMATICS I		Ty	3	1/0	0/0	4

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

- Develop the ability to reason logically and apply mathematical proof techniques to solve problems involving sets, relations, and algebraic structures.
- Solve systems of linear equations using matrix operations, and understand the structure and properties of vector spaces and linear transformations.
- Apply concepts from combinatorics, number theory, and graph theory to model and analyze discrete structures and algorithms.
- Understand and utilize eigenvalues, eigenvectors, and matrix methods in real-world applications involving both discrete and continuous systems.

COURSE OUTCOMES (Cos): Students will be able to

CO1	Apply principles of logic and set theory to formulate and solve discrete mathematical problems.
CO2	Solve systems of linear equations using matrix operations and analyze vector spaces and linear transformations.
CO3	Use combinatorial methods and basic number theory to solve counting and algorithmic problems.
CO4	Model and analyze real-world scenarios using graphs, trees, and other discrete structures.
CO5	Compute eigenvalues and eigenvectors and apply them in solving problems in engineering and computer science contexts.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	1	2	-	-	-	-	-	-	-
CO3	2	3	1	2	-	-	-	-	-	-	-
CO4	2	3	2	1	1	-	-	-	1	1	-
CO5	3	2	1	2	-	-	-	-	-	-	1

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	3	3	2
CO3	3	2	3
CO4	3	3	3
CO5	3	3	1

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical / Project
	√								

L COURSE CODE	COURSE NAME	LINEAR ALGEBRA AND DISCRETE MATHEMATICS	Ty/Lb/ ETL/IE		T/SLr	P/R	C
EBMA24002	Prerequisite: MATHAMATICS I		Ty	3	1/0	0/0	4

Unit I LOGIC 12 Hrs

Statements – Truth Table – Connectives – Normal Forms – Predicate Calculus – Inference Theory.

Unit II GROUPS 12 Hrs

Basic Concepts – Groups – Subgroups – Homomorphism – Kernel – Cosets – Lagrange's theorem - Group Homomorphisms – Rings and Fields (Definitions, Simple theorems and problems).

Unit III VECTOR SPACES 12 Hrs

Vector spaces – Subspaces – Linear Space – Linear Independence and Dependence – Basis – Dimensions (Definitions, Simple theorems and problems).

Unit IV LINEAR TRANSFORMATION 12 Hrs

Linear Transformation – Rank space and null space – Matrix representation of Linear Transformation – Inner product space – Norms – Properties (Definitions, Simple theorems and problems).

Unit V AUTOMATA 12 Hrs

Finite Automata – Regular grammar – Introduction – Context free grammar – Introduction to Turing machine – Finite state machine – Introduction – Language Recognition.

Total Hours: 60

Text book:

1. Tremblay J.P., Manohar R., Discrete Mathematical structures with applications to Computer science, McGraw Hill Publishing Co., (2017).
2. Friedberg A.H, Insel A.J. and Spence L, Linear Algebra, Pearson Education, 5th Edition, (2022).

References:

1. David C. Lay, Steven R. Lay, Judi J. McDonald, Linear Algebra and its Applications, Pearson, (2023)
2. C.V. Sastry, Rakesh Nayak, Discrete Mathematics, Pearson, (2020).
3. Kolman, Busby, Ross, Discrete Mathematical Structures, Pearson, (2015).
4. Charu C. Aggarwal, Linear Algebra and Optimization for Machine Learning, Springer, (2020).

COURSE CODE: EBCS22002	COURSE NAME: DATA STRUCTURES	Ty/ Lb/ ETL/IE	L	T/ S. Lr	P/R	C
	Prerequisite: Nil	Ty	3	1/0	0/0	4

L: Lecture T: Tutorial S.Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory andLab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Master the implementation of linked data structures such as linked lists and binarytrees
  Be familiar with advanced data structures such astrees and hashtables.
- Be familiar with several sub-quadratic sorting algorithms including quicksort, merge sort andheapsort
- Be familiar some graph algorithms such as shortest path and minimum spanning tree
- Master the standard data structure library of a major programming language(java)

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand space and time complexity of various algorithms and implement various operations on arrays and linked list[L2]
CO2	Apply major algorithms and data structures to solve problems[L3]
CO3	Design and apply tree data structure in data compression algorithms[L3]
CO4	Analyze and apply appropriate searching and/or sorting techniques in the application development[L4]
CO5	Analyze graph data structure and apply it to real world problems in finding shortest Path[L4]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1			2	2	1	2		2
CO2	3	3	3	1			3	2	3	2	1	2
CO3	3	2	3	1		1	2	2	3	1	1	2
CO4	3	3	3	1	1	1	2	2	3	2	1	2
CO5	3	3	3	1	1	1	2	3	2	1	1	1

COs / PSOs	PSO1	PSO2	PSO 3	PSO4
CO1	3	3	2	1
CO2	3	3	1	2
CO3	3	2	3	1
CO4	3	3	1	2
CO5	3	3	2	1

3/2/1 indicates Strength of Correlation ,3- High, 2- Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
				✓								

COURSE CODE: EBCS 22002	COURSE NAME:	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	DATA STRUCTURES	Ty	3	1/0	0/0	4

UNIT – I: LINEAR DATA STRUCTURES – LIST: 12 Hrs

Introduction: Abstract Data Types (ADT) **Arrays**: Definition, Single and Multidimensional Arrays, **Linked lists**: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

UNIT – II: LINEAR DATA STRUCTURES – STACK AND QUEUES: 12 Hrs

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, **Queues**: Queue ADT, Operations on Queue: ENQUE, DEQUE, Full and Empty, Circular queues, Array and linked implementation of queues, Dequeue and Priority Queue.

UNIT – III: NON-LINEAR DATA STRUCTURES – TREES: 12 Hrs

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Binary Search Trees, AVL Trees, B-Trees, Heaps.

UNIT – IV: NON-LINEAR DATA STRUCTURES –GRAPHS: 12 Hrs

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Shortest Path algorithm: Dijikstra Algorithm

UNIT – V SEARCHING, SORTING AND HASHING: 12 Hrs

Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Hashing: Hash Function, Collision Resolution Strategies

Total Hours: 60

TEXT BOOK:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education,1997.
2. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2011

REFERENCES:

1. Aaron M. Tenenbaum, YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
3. A.K. Sharma, Data Structure Using C, Pearson Education India.

COURSE CODE: EBCS22003	COURSE NAME: DATABASE MANAGEMENT SYSTEMS	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: **DATA STRUCTURES**	Ty	3	0/0	0/0	3

L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Project, R: Research C: Credits
T/L/ETL /IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

The students should be made to

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
- To develop an understanding of essential DBMS concepts such as: database security, integrity, and concurrency.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the fundamental concepts and techniques of DBMS[L2]
CO2	Apply indexing and hashing in database implementation[L3]
CO3	Analyze routine requisite for maintaining and querying databases and need for sorting and join operations in databases[L4]
CO4	Understand the importance of transaction management, concurrency control and recovery system in databases[L2]
CO5	Apply advanced representations of databases suited for real-time applications[L3]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1				2	2	2		2
CO2	3	2	3	1	1			2	2	2	1	3
CO3	2	3	3	1				1	3	3	1	3
CO4	2	3	3	1	1	1		2	3	3	1	3
CO5	3	3	3	1	1	1		3	3	2	1	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	1		1
CO2	2	1		1
CO3	1	1		1
CO4	2	1	2	1
CO5	2	1	2	1

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project	
				✓						

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBCS22003	DATABASE MANAGEMENT SYSTEMS	Ty	3	0/0	0/0	3

UNIT-I: FUNDAMENTALS OF DATABASE: 9 Hrs

Introduction - Purpose of database systems – Data Abstraction -Data models – Instances and schemas – Data Independence – DDL – DML – Database user – ER model – Entity sets- keys – ER diagram – relational model – structure – relational algebra- relational calculus- views

UNIT-II: SQL, INDEXING & HASHING: 9 Hrs

SQL - normalization – normalization using functional – Multivalued join dependence - file transaction – data dictionary – indexing and hashing basic concepts and B+ tree Indices - static and dynamic hash functions

UNIT-III: QUERY PROCESSING AND TRANSACTIONS: 9 Hrs

Overview - Measures of Query Cost - Selection Operation – Sorting - Join Operation- Transaction Concept - A Simple Transaction Model - Storage Structure – Serializability

UNIT-IV: CONCURRENCY CONTROL AND RECOVERY SYSTEM: 9 Hrs

Lock-Based Protocols - Deadlock Handling - Timestamp-Based Protocols - Validation-Based Protocols - Failures Classification – Storage - Recovery and Atomicity - Recovery Algorithm - Buffer Management

UNIT-V: ADVANCED TOPICS IN DATABASES: 9 Hrs

Database-System Architectures - Parallel Databases - Distributed Databases - Database Tuning - Introduction to Special Topics - Spatial & Temporal Databases – Data Mining and Warehousing.

Total Hours: 45

TEXT BOOKS:

1. Abraham, Silberschatz. Henry, F. K. Sudharshan, S. (2013) Database System Concepts (6th ed.) Tata McGraw Hill, New Delhi

REFERENCE BOOKS:

1. *Ramez, E. Shamkant, B. Navathe (2008) Fundamentals of database systems (5th ed.), Pearson Education*
2. *Date, C. J, (2012) An Introduction to Database Systems (8th ed.), Pearson Education*

COURSE CODE: EBEC22ID1	DIGITAL PRINCIPLES AND SYSTEM DESIGN	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To introduce number systems and codes and its conversions
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis for synchronous and asynchronous Sequential circuits

COURSE OUTCOMES (COs): Students will be able to

CO1	Acquired knowledge about number systems and its conversions
CO2	Acquired knowledge about boolean algebra
CO3	Ability to identify, analyze & design combinational circuits
CO4	Ability to identify & analyze synchronous & asynchronous circuits

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1	1	1	1	1	2	1	1
CO2	3	2	1	1	1	1	1	1	1	1	1	1
CO3	2	2	3	1	1	2	1	1	2	2	1	1
CO4	2	2	3	1	1	2	1	1	2	2	1	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	3	1	1
CO2	1	3	1	1
CO3	3	2	1	1
CO4	3	2	1	1

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project	
							✓			

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/R	C
EBEC22ID1	DIGITAL PRINCIPLES AND SYSTEM DESIGN	Ty	3	0/0	0/0	3

UNIT-I: NUMBER SYSTEMS: 9 Hrs

Review of Decimal, Binary, Octal and Hexadecimal Number Systems-Binary Addition Subtraction, Multiplication& Division—Number Conversions – Signed Magnitude form – 1's and 2's Complement - Binary weighted codes- Binary arithmetic – codes – BCD code, gray code, Excess-3 Code.

UNIT-II: BOOLEAN ALGEBRA: 9 Hrs

Binary logic Functions- Boolean laws –Boolean Algebra – Reduction of Boolean Expressions De Morgan's Theorems, Sum of Products –Product of Sums –karnaugh map- Quine McCluskey Method.

UNIT-III: COMBINATIONAL LOGIC: 9 Hrs

Logic gates – AND, OR, NOT, NOR, NAND and EX-OR Gates– Half adder –Full adder- Half subtractor–Full subtractor - Multiplexer – Demultiplexer- Encoder – Decoder.

UNIT-IV: SYNCHRONOUS/ASYNCHRONOUS SEQUENTIAL LOGIC: 9 Hrs

Latches-R-S- Flip Flop, S-R Flip Flop, D Flip Flop, JK Flip Flop, T Flip-Flop - Master slave Flip-Flop - Counters –Up Down counters- Binary Counters-Ring counter- Shift Registers.Asynchronous counters –Decade counters - State diagram - State Table – State Reduction – State Assignment- Excitation Table-Analysis of Asynchronous sequential circuits - Design of ASynchronous Sequential Circuits.

UNIT-V: MEMORY DEVICES: 9 Hrs

Basic memory structure – ROM -PROM – EPROM – EEPROM –EAPROM, RAM – Static and dynamic RAM - Programmable Logic Devices – Programmable Logic Array (PLA) -Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using PLA, PAL.

Total Hours: 45

TEXT BOOKS:

1. Charles H. Roth & Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning, 7th Edition.
2. M. Morris Mano & Michael D. Ciletti (2008) Digital Design. Pearson Education
3. Thomas.L. Floyd (2013) "Digital Fundamentals", 10th Edition Pearson Education
4. A. Anand Kumar ―Fundamentals of Digital Circuits‖, 4th Edition, PHI Learning Private Limited, 2016.
5. Soumitra Kumar Mandal ― Digital Electronics‖, McGraw Hill Education Private Limited,2016.

REFERENCE BOOKS:

1. *Ronald J. Neal S. Gregory L (2009), "Digital Systems", 10th Edition, Pearson Prentice Hall.*
2. *R P Jain, (2010), "Modern Digital Electronics", 4th Edition, Tata Mcgraw Hill Ed. Pvt. Ltd*

COURSE CODE EBCS22011	COURSE NAME: ARTIFICIAL INTELLIGENCE	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To gain a historical perspective of AI and its foundations.
- To become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- The students will be able to solve problems using AI techniques.
- To develop new games using AI techniques.
- To guide the process of deducing information in a computational manner.

COURSE OUTCOMES (COs): Students will be able to

CO1	Illustrate different types of AI agents and searching strategies.
CO2	Discover to inference the knowledge and plan effectively.
CO3	Discuss the techniques used for game playing using various search algorithms.
CO4	Analyze various types of planning to create effective AI applications.
CO5	Classify various learning techniques.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	1	1	1	1	1	1	1	1	3
CO2	3	3	1	1	3	3	2	1	3	2	1	3
CO3	2	3	2	2	3	3	1	1	3	3	1	3
CO4	3	3	3	3	3	2	2	2	3	3	2	3
CO5	1	1	1	1	2	1	3	2	1	1	3	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1
CO2	3	3	3	2
CO3	3	2	2	3
CO4	2	3	3	3
CO5	3	2	3	3

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project	
				✓						

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCS22011	ARTIFICIAL INTELLIGENCE	Ty	3	0/0	0/0	3

UNIT-I: Introduction and Agents: **9 Hrs**

Introduction– History of AI-Intelligent agent –Structure of Agents– Problem solving agents - Uninformed search strategies-Searching with partial information.

UNIT-II: Informed Search Methods and Game Playing: **9 Hrs**

Informed search Strategies – A* Heuristic function – Hill Climbing search – Constraint Satisfaction problem - Optimal decisions in games – Pruning –Alpha-Beta pruning.

UNIT-III: Knowledge and Logic: **9 Hrs**

Knowledge based agent – The Wumpus world environment –Propositional Logic- First-order logic – Syntax and Semantics of FOL-Knowledge engineering process –Inference in FOL – Forward and backward chaining algorithm.

UNIT-IV: Planning: **9 Hrs**

Planning Problem-Language of planning problems-Planning with state space search-Partial order planning-Planning Graphs-Planning with propositional logic-Analysis of planning approaches.

UNIT-V: Forms of Learning: **9 Hrs**

Inductive learning-Learning Decision Trees-Ensemble Learning-Logical formulation of learning-Explanation based learning-Learning using relevance information.

Total Hours: 45

TEXT BOOKS:

1. Stuart R. Peter N. (2010) Artificial Intelligence a Modern Approach, Prentice Hall
2. Elaine R. Kevin K. (2008) Artificial Intelligence Tata McGraw Hill

REFERENCE BOOKS:

1. *Tim Jones M. (2008) Artificial Intelligence, A System Approach (Computer Science)*
2. *Ben Coppin (2004) Artificial intelligence illuminated, Jones and Bartlett Learning*

COURSE CODE: EBCC22ET1	COURSE NAME: UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: None, UHV1 (Desirable)	ETL	1	0/0	2/0	2

L: LectureT: TutorialSLr: SupervisedLearningP: ProjectR: ResearchC: CreditsT/L/ETL/IE: Theory/Lab/Embedded Theoryand Lab/Internal Evaluation

OBJECTIVES:

The students should be made toHuman Values Cour**ses:** During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

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.

COURSEOUTCOMES(Cos): The students will be ableto

CO1	Relate self and surroundings and identify responsibility in life
CO2	Associate human relationship and nature to handle problems and provide sustainable solutions
CO3	Develop critical ability and engage in reflective and independent Thinking
CO4	Show commitment towards understanding of values
CO5	Apply Human values in day to day setting in real life

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			1	1		2	1		1	1		2
CO2			2	2	1	2	3	1		2		2
CO3			1	1	1	2			1	2		3
CO4			2		1	1	1	3	1	1		3
CO5			1			2	1	2	1	1		3

Cos/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1
CO2	2	2	2	2
CO3	1	1	1	1
CO4	1	1	1	2
CO5	1	2	2	1

3/2/1indicates strength of correlation3 –High,2–Medium,1– Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
			√				√		

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCC22ET1	UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY	ETL	1	0/0	2/0	2

UNIT-I: Introduction - Need, Basic Guidelines, Content and Process for Value Education: 9 Hrs

Purpose and motivation for the courser capitulation from Universal HumanValues-I - Self-Exploration– what is it? -Its content and process; 'Natural Acceptance'and Experiential Validation-as the process for self-exploration. – Continuous Happiness and Prosperity-A look at basic Human Aspirations - Right understanding, Relationship and Physical Facility-the basic requirements for fulfilment of aspirations of every human being with their correct priority- Understanding Happiness and Prosperity correctly-Acritical appraisal of the current scenario– 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 forliving with responsibility (living in relationship, harmony and co-existence) rather than asarbitrariness in choice based on liking-disliking.

UNIT-II: Understanding Harmony in the Human Being - Harmony in Myself! 9 Hrs

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

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

UNIT-III: Understanding Harmony in the Family and Society- Harmony in HumanRelationship: 9 Hrs

Understanding values in human-human relationship; meaning of Justice (nine universal values inrelationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect asthe foundational values of relationship - Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the othersalient values in relationship - Understanding the harmony in the society (society being an extension of family): Resolution,Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society, Universal Order- fromfamily 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 valuein relationship. Discuss with scenarios. Elicit examples from students' lives.

UNIT-IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: 9 Hrs

Understanding the harmony in the Nature - Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self-regulationin nature - Understanding Existence as Co-existence of mutually interacting units in all-pervasive space - Holistic perception of harmony at all levels of existence - Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" canbe used), pollution, depletion of resources and role of technology etc.

UNIT-V: Implications of the above Holistic Understanding of Harmony on ProfessionalEthics: 9 Hrs

Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics: a. Ability to utilize the professional competence foraugmenting universal human order b. Ability to identify the scope and characteristics of peoplefriendlyand eco-friendly production systems, c. Ability to identify and develop appropriatetechnologies and management patterns for above production systems. - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order: ((a) At the level ofindividual: as socially and ecologically responsible engineers, technologists and managers, (b)Atthe level of society: as mutually enriching institutions and organizations - Sum up .Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g.To discuss the conduct as an engineer or scientist etc.

Total Hours:45

Text Book:

Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
Reference BooksJeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.The Story of Stuff (Book). The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi. mall is Beautiful - E. F Schumacher.

COURSE CODE: EBCS22L01	COURSE NAME: DATA STRUCTURES LAB	Ty/Lb/ ETL/E	L	T/S. Lr	P/R	C
	Prerequisite: C PROGRAMMING AND MS	Lb	0	0/0	3/0	1

L: Lecture T: Tutorial S.Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory andLab/Internal Evaluation

OBJECTIVES: The students should be made to

- To strengthen their problem-solving ability by applying the characteristics of an object-oriented approach.
- To introduce object-oriented concepts inJava.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the basic operations on arrays, lists, stacks and queue data structures
CO2	Apply non linear data structure in real world application
CO3	Apply various data structures in simple applications
CO4	Analyze algorithms for operations on Binary Search Trees
CO5	Analyze the complexity of given algorithms

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1				2	2	2		2
CO2	3	2	3	1	1			2	2	2	1	3
CO3	2	3	3	1				1	3	3	1	3
CO4	2	3	3	1	1	1		2	3	3	1	3
CO5	3	3	3	1	1	1		3	3	2	1	3
	3	2	2	1				2	2	2		2

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	1		1
CO2	2	1		1
CO3	1	1		1
CO4	2	1	2	1
CO5	2	1	2	1

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project	
									✓	

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCS22L01	DATA STRUCTURES LAB	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

1. Write a program to implement list ADT using arrays and linked list.
2. Write a Program to implement the following using an array a) Stack ADT b) Queue ADT.
3. Write a Program to implement the following using a singly linked list a) Stack ADT b) Queue ADT.
4. Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression.
5. Write a Program to traverse binary tree in preorder, postorder and inorder.
6. Write a program to perform the following operations a) Insert an element into a binary search tree. b) Delete an element from a binary search tree.c) Search for a key element in a binary search tree.
7. Write a Program for the implementation of Binary Heaps
8. Write a Program for the implementation of Breadth First Search and Depth First Search.
9. Write a Program for the implementation of Linear Search and Binary Search
10. Write a Program for sorting. (bubble sort, insertion sort, shell sort, heap sort)
11. Write a Program for the implementation of Collision Resolution using Open Addressing Software requirement: C/C++

Total Hours:45

COURSE CODE: EBCS22L02	COURSE NAME: DATABASE MANAGEMENT SYSTEM LAB	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: DATA STRUCTURES LAB	Lb	0	0/0	3/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

Thestudents should be made to

- To create a database and query it using SQL, design forms and generate reports.
- Understand the significance of integrity constraints, referential integrity constraints, triggers, assertions.

COURSE OUTCOMES (COs): Students will be able to	
CO1	Understand the programming and theoretical concept of commands[L2]
CO2	Analyze the problem and apply the syntactical structure of query[L4]
CO3	Remember the structure and syntax of PL/SQL[L1]
CO4	Understand the problem and apply the programming knowledge for determining solutions[L2]
CO5	Applying the knowledge gained to design a database [L3]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1				2	2	2		2
CO2	3	2	3	1	1			2	2	2	1	3
CO3	2	3	3	1				1	3	3	1	3
CO4	2	3	3	1	1	1		2	3	3	1	3
CO5	3	3	3	1	1	1		3	3	2	1	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	1		1
CO2	2	1		1
CO3	1	1		1
CO4	2	1	2	1
CO5	2	1	2	1

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
									✓

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCS22L02	DATABASE MANAGEMENT SYSTEM LAB	Lb	0	0/0	3/0	1

I. Program to learn DDL and DML commands

1. Execution of data description language commands
2. Execution of data manipulation language commands
3. Execution of data control language commands
4. Execution of transaction control language commands
5. Insert command
6. SQL Queries
    a. Simple SQL Queries
    b. Nested Queries
    c. Aggregation Operators
    d. Grouping and Ordering commands
7. Select, from and where clause
8. Set operation [union, intersection, except]
9. String operations
10. Join operation
11. Modification of the database

II. PL / SQL programs

1. Control statements (for loop)
2. Control statements (while loop)
3. Control statements (for reverse loop)
4. Control statements (loop end loop)
5. Sum of even numbers
6. Sum of odd numbers
7. Series generation
8. Implementation of sub-program
9. Implementation of cursor using pl/sql
10. Control statement (if-else end if)

Total Hours:45

COURSE CODE: EBEC22IL1	COURSE NAME: DIGITAL SYSTEMS LAB	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: SOLID STATE PHYSICS	Lb	0	0/0	3/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

Thestudents should be made to

- To introduce number systems and codes and its conversions
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis for synchronous and asynchronous Sequential circuits

COURSE OUTCOMES (COs): Students will be able to

CO1	Acquired knowledge about number systems and its conversions
CO2	Acquired knowledge about boolean algebra
CO3	Ability to identify, analyze & design combinational circuits
CO4	Ability to identify & analyze synchronous & asynchronous circuits

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1	1	1	1	1	2	1	1
CO2	3	2	1	1	1	1	1	1	1	1	1	1
CO3	2	2	3	1	1	2	1	1	2	2	1	1
CO4	2	2	3	1	1	2	1	1	2	2	1	1

COs/ PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	3	1	1
CO2	1	3	1	1
CO3	3	2	1	1
CO4	3	2	1	1

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
							✓		✓

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBEC22IL1	DIGITAL SYSTEMS LAB	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

1. Verification of Truth tables of Logic Gates
2. Implementation of Boolean function
3. Implementation of Adders&Subtractors
4. Implementation of Multiplexers
5. Implementation of Demultiplexers
6. Implementation of Encoder
7. Implementation of Decoders
8. Verification of Flip – Flops
9. Implementation of SISO, SIPO,
10. Implementation of PISO, PIPO
11. Implementation of Johnson counter
12. Study of Modulo-N Counter

Total Hours:45

COURSE CODE EBCS22ET3	COURSE NAME: OBJECT ORIENTED PROGRAMMING WITH C++ / JAVA	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: C PROGRAMMING AND MS OFFICE TOOLS	ETL	2	0/0	2/0	3

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Understand the basic concepts and techniques which form the object-oriented programming paradigm.
- Remember the operator concepts
- Design the applications using File concepts

COURSE OUTCOMES (COs): Students will be able to

CO1	Understanding the Basic Concepts of object-oriented programming. [L2]
CO2	Getting Knowledge about Classes and Objects[L2]
CO3	Imparting skills on various kinds of overloading and inheritance concepts[L3]
CO4	Design generic classes with C++ templates[L6]
CO5	Develop an Application with C++ Techniques[L6]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	2	2	1	1	2	1	1	1
CO2	3	2	2	2	2	2	1	2	2	2	1	1
CO3	3	3	2	2	2	2	1	1	1	2	1	2
CO4	3	2	2	2	1	2	2	1	2	2	1	2
CO5	3	3	2	1	1	2	1	2	1	2	1	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	3	1	1
CO2	1	3	1	1
CO3	2	3	2	1
CO4	2	3	1	2
CO5	1	3	1	1

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project	
				✓						

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCS22ET3	OBJECT ORIENTED PROGRAMMING WITH C++ / JAVA	ETL	2	0/0	2/0	3

UNIT-I: **9 Hrs**

BASIC CONCEPTS OF OOPS: Programming methodologies - Object Oriented Concepts –Features & Applications of OOPS-Benefits of OOPS–Structure of C++ - C++ Tokens-Operators in C++ - Data types- Control statements – Arrays

UNIT- II: **9 Hrs**

Class & Objects: Classes and Objects-Abstraction-Encapsulation-Definition - Data members - Function members - Access Modifiers– Constructors – Types of Constructors– Destructors - Static members - Inline functions- Arrays of Object

UNIT- III: **9 Hrs**

INHERITANCE AND POLYMORPHISM: Overloading Operators - Rules for Operator overloading, – Function Overloading- Overloading Unary& Binary Operators – Friend Function - Virtual functions - Abstract Classes -Inheritance –Definition –Single Inheritance-Multiple Inheritance-Hierarchical Inheritance-Single Inheritance-Hybrid Inheritance.

UNIT- IV: **9 Hrs**

TEMPLATES & EXCEPTION HANDLING: Class Templates - Function Templates - Overloading Template Functions-Basics of Exception handling –Try-Catch-Throw – Rethrowing an Exception, Exception specifications, Processing Unexpected Exceptions-Error handling during File operations, Formatted I/O.

UNIT- V: **9 Hrs**

Files and Streams: Creating a Sequential Access File- Reading Data from A Sequential Access File, Updating Sequential Access Files-Random Access Files-Creating A Random-Access File- Writing Data Randomly to a Random-Access File- Reading Data Sequentially from a Random-Access File. Stream Input/Output Classes and Objects, Stream Output, Stream Input, Unformatted I/O (with read and write), Stream Manipulators, Stream Format States, Stream Error States.

TEXT BOOKS:

1. Stanley, B. Lippman (2012) The C++ Primer, (5th ed.), Addison Wesley
2.C++ How to Program by H M Deitel and P J Deitel, 1998, Prentice Hall

REFERENCES:

1. Stroustrup, B (2004) The C++ Programming Language, (3 rd ed.), Pearson Education
2. Balagurusamy, E (2008) Object Oriented Programming with C++, (4th ed.), Tata Mcgraw Hill

LIST OF EXPERIMENTS (15 Hrs) **Total Hours-60**

a) Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
b) Write a C++ program to find both the largest and smallest number in a list of integers.
c) Write a C++ program to sort a list of numbers in ascending order.
d) Write a Program to Demonstrate Friend Function and Friend Class.
e) Write programs to implement multiple inheritance.
f) Write a program in C++ to calculate simple and compound interest.

IV SEMESTER

COURSE CODE	COURSE NAME	PROBABILITY AND STATISTICS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBMA24003	Prerequisite: MATHEMATICS I		Ty	3	1/0	0/0	4

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

- Understand the fundamental concepts of probability, including probability rules, conditional probability, and independence.
- Analyze random variables, probability distributions, and their properties, including discrete and continuous distributions.
- Apply statistical methods to summarize data using measures of central tendency, dispersion, and graphical representations.
- Perform hypothesis testing, confidence interval estimation, and regression analysis to interpret and solve real-world problems

COURSE OUTCOMES (Cos): Students will be able to

CO1	Understand and apply fundamental probability concepts including conditional probability and Bayes' theorem.
CO2	Analyze discrete and continuous random variables and their probability distributions
CO3	Compute and interpret measures of central tendency, variability, and correlation from data sets.
CO4	Perform hypothesis testing and construct confidence intervals for population parameters.
CO5	Apply regression and correlation techniques to model relationships between variables

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	1	2	1	1	1	1	1	2	1
CO2	3	3	1	2	2	1	1	1	1	2	1
CO3	2	3	1	2	2	1	1	1	1	2	1
CO4	2	3	2	3	2	1	1	1	1	2	1
CO5	2	3	2	2	3	1	1	1	1	2	1

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	3	3	2
CO3	2	3	2
CO4	2	3	3
CO5	2	2	3

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical / Project
	√								

COURSE CODE	COURSE NAME	PROBABILITY AND STATISTICS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBMA24003	Prerequisite: MATHEMATICS I		Ty	3	1/0	0/0	4

Unit I BASICS OF STATISTICS **12 Hrs**

Variables – Uni-variate Data – Frequency Distribution – Measures of Central Tendency – Mean –Median – Mode – Quartiles – Measures of Dispersion – The Range – Mean deviation -Quartile Deviation –Standard Deviation – Relative Measures of Dispersion – Coefficient of Variation – Quartile Coefficient of Variation – Skewness and Kurtosis (Definition and Simple problems).

Unit II PROBABILITY AND RANDOM VARIABLE **12 Hrs**

Axioms of Probability - Independent Events – Mutually exculsive Events– Conditional probability – Total probability – Baye's Theorem – Random variable – Probability mass function – Probability density function – Properties (Definition and simple problems).

Unit III CORRELATION & REGRESSION **12 Hrs**

Bi-variate data – Applications of Correlation: Karl Pearson's Coefficient of Correlation – Rank Correlation: Spearman's Rank Correlation – Linear Regression

Unit IV STANDARD DISTRIBUTIONS **12 Hrs**

Binomial – Poisson – Geometric –Uniform – Exponential –Normal distributions

Unit V TESTING OF HYPOTHESIS **12 Hrs**

Tests of Significance – Null hypothesis – Alternative hypothesis – Critical points - Large Sample Tests – Mean proportions– Small Sample Tests – t, F, Chi-square Tests: Independence of Attributes, Goodness of Fit.

Total Hours: 60

Text book:

1) Richard Johnson A., *Miller & Freund's Probability and statistics for Engineers (9th ed)*, Prentice Hall of India, (2020).
2) Jay L. Devore, *Probability and Statistics for Engineering and the Sciences*, Indian ed., Cengage India Pvt. Limited, (2020).

References:

1) Charu C. Aggarwal, *Probability and Statistics for Machine Learning*, Springer, (2024)
2) Veerarajan T., *Probability, Statistics and, Random Processes*, Tata McGraw Hill Publishing Co., (2017).
3) Sheldon Ross, *A first course in Probability*, Pearson, (2022).
4) Gupta S.C., Kapoor V.K., *Fundamentals of Mathematical Statistics*, 12th Ed., S. Chand& Co., (2020).

COURSE CODE EBCS22005	COURSE NAME: OPERATING SYSTEM	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Computer Organization and Architecture	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- understandthe concepts of Operating System and process.
- Illustrate the Scheduling of a processor for a given problem instance, identify the dead lock situation and provide appropriate solution, analyze memory management techniques and implement page replacement Algorithm, understand the implementation of file systems and directories.
- appreciate emerging trends in operating systems.

COURSE OUTCOMES (COs): Students will be able to

CO1	Remember and Understand functions, structures and history of operating systems[L1]
CO2	Analyze various functions of CPU processing algorithms[L4]
CO3	Understand the concept of hazard and analyze with prevention process[L2]
CO4	Analyze various memory management schemes[L4]
CO5	Apply the functionality of file systems[L3]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	1	1		1		2	1
CO2	3	3	2	1	1	1				1	2	2
CO3	3	3	3	1	2	1			1		1	
CO4	3	3	3	1	1	2	1			1		
CO5	3	3	3	2	2	2			1	1		

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2
CO2	3	3	1	2
CO3	3	3	3	3
CO4	3	3	2	3
CO5	3	3	2	2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	InterDisciplinary	Skill Component	Practical /Project	
				✓						

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCS22005	OPERATING SYSTEM	Ty	3	0/0	0/0	3

UNIT-I: **9 Hrs**

concepts& processes:

Introduction -Computer system architecture-operating system structure-operations-management of process, memory, storage-protection and security-Operating System Services-System Calls-types-System Programs-System Structure-Virtual Machines-System Design and Implementation- Process Concept-Process Scheduling-Operation on Process-Cooperating Processes- Inter Process Communication

UNIT-II: **9 Hrs**

Process Management, synchrOnization and deadlocks:

Threads-Multithreading Models. CPU Scheduling Concepts-Scheduling Criteria-Scheduling Algorithms-Threads and Multiple-Processor Scheduling-Real Time Scheduling- - Process Synchronization-The Critical Section Problem-Synchronization-Peterson solution, mutex-Hardware-Semaphores Monitor-Deadlocks-Deadlock Characterization-Methods of Handling Deadlocks-Deadlock Prevention-Deadlock Avoidance-Deadlock Detection-Recovery form Deadlock

UNIT-III: **9 Hrs**

Memory Management:

Main Memory-Swapping-Contiguous Memory Allocation - Address Translation - Paging - Segmentation – Virtual Memory-Demand paging-page replacement-thrashing-allocating Kernel memory.

UNIT- IV: **9 Hrs**

STORAGE MANAGEMENT:

Files And Secondary Storage Management: File Concepts - Access Methods - Directory Structure - File System Mounting - File Sharing -Protection - File System Structure - Implementation - Recovery - Disk Structure - Disk Scheduling - Disk Management- I/O Systems

UNIT- V: **9 Hrs**

CASE STUDY:

Linux System — Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Network Structure, Security. Windows 10 - Design Principles, System Components, Terminal Services and fast user switching, File System, Networking, Programmer Interface.

Total Hours: 45

TEXT BOOKS:

1.Abraham Silberschatz, Peter B. Galvin, Greg Gagne(2018) Operating System Concepts (10th ed.), ISBN: 978-1-119-32091-3

REFERENCE BOOKS:

1. *D.M. Dhamdhere. D. M. (2012) Operating Systems, (3 rd ed.), Tata McGraw Hill*
2. *Tanenbaum (2015) Modern Operating Systems, Pearson Publication.*

William Stallings (2015) Operating Systems (8 th ed.) Prentice Hall of India

COURSE CODE: EBCS22004	COURSE NAME: DESIGN AND ANALYSIS OF ALGORITHMS	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: DATA STRUCTURES	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

Thestudents should be made to:

- To Learn the algorithm analysis techniques.
- To understand the different algorithm design techniques.
- To Understand Iterative algorithms
- To Understand the limitations of Algorithm power

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the fundamentals of algorithms[L2]
CO2	Analyze time complexity of various algorithms[L4]
CO3	Apply the different problem-solving techniques to solve basic mathematical problems[L3]
CO4	Analysing the structure of tree and graphs to identify the limitations in solving the problem[L4]
CO5	Evaluate the algorithms for solving real world applications[L5]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2					2	2		2
CO2	3	3	3	1					3	2		2
CO3	3	2	2	2					3	2		2
CO4	2	3	3	1			1		2	2	1	2
CO5	2	3	3	1	1		1		2	2	1	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1
CO2	3	3	1	1
CO3	3	2	2	2
CO4	3	3	3	2
CO5	3	3	3	3

3/2/1indicates Strength of Correlation, 3- High, 2- Medium, 1-Low:

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	InterDisciplinary	Skill Component	Practical /Project
				✓					

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCS22004	DESIGN AND ANALYSIS OF ALGORITHMS	Ty	3	0/0	0/0	3

UNIT-I: BASIC CONCEPTS AND INTRODUCTION TO ALGORITHMS: 9 Hrs
Introduction-Historical Background-Time Complexity-Space Complexity— Fundamentals of Algorithmic Problem Solving — Important Problem Types ——Asymptotic Notations and their properties. Analysis Framework — Empirical analysis — Mathematical analysis for Recursive and Non-recursive algorithms — Visualization

UNIT-II: BRUTE FORCE AND DIVIDE-AND-CONQUER: 9 Hrs
Brute Force – Closest-Pair and Convex Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem. Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication-Closest-Pair and Convex Hull Problems.

UNIT-III: DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE: 9 Hrs
Computing a Binomial Coefficient – Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees.

UNIT-IV: ITERATIVE IMPROVEMENT: **9 Hrs**
The Simplex Method-The Maximum-Flow Problem – Maximm Matching in Bipartite Graphs- The Stable marriage Problem.

UNIT-V: COPING WITH THE LIMITATIONS OF ALGORITHM POWER: 9 Hrs
Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems–Coping with the Limitations – Backtracking – n-Queens problem – The 3-Coloring Problem-Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

Total Hours: 45

TEXT BOOK:

1. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. M. H. Alsuwaiye, "Voronoi Diagrams", Third Edition, World Scientific.

REFERENCE BOOKS*:*

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3.Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
4. http://nptel.ac.in/

COURSE CODE EBCS22015	COURSE NAME: MACHINE LEARNING	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Artificial Intelligence	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- understand the need for machine learning for various problem solving
- Known the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- understand the latest trends in machine learning
- design appropriate machine learning algorithms for problem solving

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand various machine learning algorithms and terminologies and perform data pre-processing[L2]
CO2	Apply appropriate supervised learning algorithms to design predictive models to solve any given problem[L3]
CO3	Apply appropriate unsupervised learning algorithms and develop applications for performing clustering and dimensionality reduction[L3]
CO4	Evaluate the solutions for complex problems using artificial neural networks and kernel machines[L5]
CO5	Understand and apply probabilistic graphical models for suitable applications[L2]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	3	2	1	1			1	1
CO2	3	3	3	3	3	1	1				1	1
CO3	3	3	3	3	3	2	1	1			1	1
CO4	3	3	3	3	3	2	1				1	2
CO5	3	3	3	3	3	1	1				1	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	3
CO2	3	2	2	2
CO3	3	2	3	3
CO4	3	3	2	3
CO5	3	3	3	3

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project	
				√						

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCS22015	MACHINE LEARNING	Ty	3	0/0	0/0	3

UNIT-I: INTRODUCTION TO MACHINE LEARNING: 9 Hrs

Machine Learning Fundamentals –Types of Machine Learning - Supervised, Unsupervised, Reinforcement- The Machine Learning process. Terminologies in ML- Testing ML algorithms: Overfitting, Training, Testing and Validation Sets-Confusion matrix -Accuracy metrics- ROC Curve-Basic Statistics: Averages, Variance and Covariance, The Gaussian- The Bias-Variance trade off-Applications of Machine Learning.

UNIT-II: SUPERVISED LEARNING: 9 Hrs

Regression: Linear Regression – Multivariate Regression- Classification: Linear Discriminant Analysis, Logistic Regression- K-Nearest Neighbor classifier. Decision Tree based methods for classification and Regression- Ensemble methods.

UNIT-III: UNSUPERVISED LEARNING: 9 Hrs

Clustering- K-Means clustering, Hierarchical clustering - The Curse of Dimensionality – Dimensionality Reduction - Principal Component Analysis - Probabilistic PCA- Independent Components analysis

UNIT-IV: ARTIFICIAL NEURAL NETWORKS AND KERNEL MACHINES: 9 Hrs

Perceptron- Multilayer perceptron- Back Propagation – Initialization, Training and Validation Support Vector Machines (SVM) as a linear and non-linear classifier - Limitations of SVM

UNIT-V: PROBABILISTIC GRAPHICAL MODELS: 9 Hrs

Bayesian Networks - Learning Naive Bayes classifiers-Markov Models – Hidden Markov ModelsSampling – Basic sampling methods – Monte Carlo -Reinforcement Learning

Total Hours: 45

TEXT BOOKS:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
2. Stephen Marsland, “Machine Learning –An Algorithmic Perspective”, CRC Press, 2009.
3. SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning”, Pearson Education, 2018.
4. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2011.

REFERENCE BOOKS:

1. Andreas C. Muller, “Introduction to Machine Learning with Python: A Guide for Data Scientists”, O’Reilly,2016.
2. Sebastian Raschka, “Python Machine Learning”, Packt Publishing, 2015

COURSECODE: EBCC22I04	COURSE NAME THE INDIAN CONSTITUTION (Audit Course)	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: NIL	IE	2	0/0	0/0	0

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to

- To provide an overview of the history of the making of Indian Constitution
- To understand the preamble and the basic structures of the Constitution.
- To Know the fundamentalrights, duties and the directive principles of state policy
- To understand the functionality of the legislature, the executive and the judiciary

COURSE OUTCOMES (Cos): Students will be able to

CO1	To provide an overview of the history of the making of Indian Constitution
CO2	To understand the preamble and the basic structures of the Constitution.
CO3	To Know the fundamental rights, duties and the directive principles of state policy

Mapping of Course Outcomes with Program Outcomes (Pos):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3	1	1	1	1		
CO2						3	1	1	1	1		
CO3						3	1	1	2			

Cos / PSOs	PSO1	PSO2	PSO3	PSO 4
CO1	1	1	2	3
CO2	1	1	2	2
CO3	1	1	2	1

3/2/1 indicates Strength of Correlation 3- High, 2- Medium, 1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
			✓				✓					

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCC22I04	**THE INDIAN CONSTITUTION (Audit Course)**	IE	**2**	**0/0**	**0/0**	**0**

UNIT-I: **6 Hrs**
The History of the Making of Indian Constitution, Preamble and the Basic Structures

UNIT-II: **6 Hrs**
Fundamental Rights and Duties, Directive Principles of State Policy

UNIT-III: **6 Hrs**
Legislature, Executive and Judiciary

UNIT-IV: **6 Hrs**
Emergency Powers

UNIT-V: **6 Hrs**
Special Provisions for Jammu and Kashmir, Nagaland and Other Regions, Amendments

Total Hours: 30

TEXT BOOKS:

1. D DBasu, Introduction to the Constitution of India, 20thEdn., Lexisnexis Butter worths, 2012.

REFERENCE BOOKS:

1.Rajeev Bhargava(ed), Ethics and Politics of the Indian Constitution, Oxford University Press, NewDelhi, 2008.
2. GranvilleAustin, TheIndianConstitution: CornerstoneofaNation, OxfordUniversityPress, Oxford, 1966.
3. Zoya Hassan, E. Sridharan andR. Sudarshan (eds), India's Living Constitution: Ideas, Practices, Controversies, Permanent Black, NewDelhi, 2002.
4.SubhashC.Kashyap, OurConstitution, NationalBookTrust, NewDelhi, 2011.

COURSE CODE EBCC22I05	COURSE NAME: THE INDIAN TRADITIONAL KNOWLEDGE (Audit Course)	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: NIL	IE	2	0/0	0/0	0

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL /IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES: The students should be made to

- To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System
- To understandtheTraditional Medicine, Traditional Production and Construction Technology
- To Know the History of Physics and Chemistry, Traditional Art and Architecture and VastuShashtra, Astronomy and Astrology
- To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India
-

COURSE OUTCOMES (COs): Students will be able to

CO1	To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System
CO2	To understandtheTraditional Medicine, Traditional Production and Construction Technology
CO3	To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

Mapping of Course Outcomes with Program Outcomes (Pos):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	3	1		2				2		1
CO2		3	3	1		2				2		1
CO3		3	3	1		2				2		1

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	2
CO2	1	1	2	1
CO3	1	1	2	3

3/2/1 indicates Strength of Correlation 3- High, 2- Medium, 1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
			✓				✓		

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCC22I05	**THE INDIAN TRADITIONAL KNOWLEDGE (Audit Course)**	IE	**2**	**0/0**	**0/0**	**0**

UNIT-I: **6 Hrs**

Historical Background: TKS During the Pre- colonial and Colonial Period, Indian Traditional Knowledge System

UNIT-II: **6 Hrs**

Traditional Medicine, Traditional Production and Construction Technology

UNIT-III: **6 Hrs**

History of Physics and Chemistry, Traditional Art and Architecture and VastuShashtra, Astronomy and Astrology

UNIT-IV: **6 Hrs**

Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

UNIT-V: **6 Hrs**

TKS and the Contemporary World, TKS and the Indian Union, TKS and IT Revolution

Total Hours: 30

TEXT BOOKS:

1. Amit Jha (2009), Traditional knowledge system in india, 1st Edition, Delhi University (North Campus)
2. Dr.A.K. Ghosh (2011), Traditional Knowledge of Household Products

COURSE CODE: EBCS22L03	COURSE NAME: DESIGN AND ANALYSIS OF ALGORITHMS LAB	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: DATA STRUCTURES LAB	Lb	0	0/0	3/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL /IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

The students should be made to

- Teach the student the fundamental algorithms
- Teach the student how to analyze the performance of algorithms

COURSE OUTCOMES (Cos): Students will be able to	
CO1	Design and analyze the performance of algorithms that employ various strategy[L4]
CO2	Apply the fundamental algorithms of sorting to solve problems [L3]
CO3	Analyze the average-case running times of randomized algorithms, and shortest path algorithms[L4]
CO4	Evaluate and apply classical sorting, searching, optimization and graph algorithms[L5]
CO5	Apply Back tracking and Binary search algorithm to solve problems[L3]

Mapping of Course Outcomes with Program Outcomes (Pos):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	1	1	2	1	1	2	1
CO2	3	3	2	1	2	1	2	2	3	2	2	2
CO3	2	2	2	3	3	2	1	2	3	1	2	2
CO4	3	2	2	2	2	1	2	2	3	2	2	2
CO5	3	2	1	3	1	2	3	2	2	1	1	1

Cos / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	3	2	1
CO3	2	2	2	3
CO4	3	2	2	2
CO5	3	2	1	3

3/2/1 indicates Strength of Correlation 3- High, 2- Medium, 1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
									✓

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/I E	L	T/S. Lr	P/R	C
EBCS22L03	DESIGN AND ANALYSIS OF ALGORITHMS LAB	Lb	0	0/0	3/0	1

List of Experiments:

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.
2. Write a program to analyse all the complexity of Strassen matrix with minimum matrix size of 4*4
3. Compute the transitive closure of a given directed graph by using Warshall's algorithm.
4. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
5. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
6. To write a program to solve the knapsack problem using greedy method.
7. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
8. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
9. Implement N Queen's problem using Back Tracking.

Total Hours: 45

COURSE CODE EBCS22L04	COURSE NAME: OPERATING SYSTEM LAB	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: NIL	Lb	0	0/0	3/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To learn to Create processes and implement IPC
- To learn to use system calls through C programs
- To learn to use the file system related system calls
- To gain knowledge to Analyze the performance of the various Page Replacement Algorithms
- To learn to Implement File Organization and File Allocation Strategies

COURSE OUTCOMES (Cos): Students will be able to

CO1	Understand processes concept and implement IPC[L2]
CO2	Understand and apply Deadlock avoidance and Detection Algorithms[L3]
CO3	Analyze the performance of various CPU Scheduling Algorithms[L4]
CO4	Analyze the performance of the various Page Replacement Algorithms[L4]
CO5	Apply File Organization and File Allocation Strategies[L3]

Mapping of Course Outcomes with Program Outcomes (Pos):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1				2	2	2		2
CO2	3	2	3	1	1			2	2	2	1	3
CO3	2	3	3	1				1	3	3	1	3
CO4	2	3	3	1	1	1		2	3	3	1	3
CO5	3	3	3	1	1	1		3	3	2	1	3

Cos / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2
CO2	3	3	2	3
CO3	3	2	2	2
CO4	3	3	3	1
CO5	3	1	2	1

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
									✓

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCS22L04	OPERATING SYSTEM LAB	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

1. Basic UNIX commands – learning and usage.

2. Shell Programming.

3. File system related system calls. (Learn to create, open, read, write, seek into, close files & open, read, write, search, close directories).

4. Process management – Fork, Exec (Learn to create a new process and to overlay an executable binary image on an existing process).

5. Process synchronization using semaphores (Solutions to synchronization problems like producer consumer problem, dining philosopher's problem etc...).

6. Inter-process communication among unrelated processes using shared memory.

7. CPU Scheduling algorithms.

8. Implementation of Deadlock Detection Algorithm

9. Contiguous memory allocation strategies – best fit, first fit and worst fit strategies.

10. Page replacement algorithms

Total Hours:45

COURSE CODE	COURSE NAME	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24L01	Prerequisite: AI AND ML		Lb	0	0/0	3/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to
To refresh and stimulate students' English learning through Content Integrated Language Learning to have an in-depth understanding of the components of English language and its use in communication that they are competent in inter-personal and academic communication for a successful

COURSE OUTCOMES(Cos): Students will be able to

CO1	Implement and analyzese archalgorithmstosolvereal-world problems, demonstratingan Understanding of heuristic search techniques and their applications in AI.
CO2	Apply machine learning algorithms to classify and predict outcomes for given datasets, Evaluating their accuracy and performance.
CO3	Design and implement clustering algorithms to group data into meaningful clusters, and compare the quality of clustering results using appropriate metrics.
CO4	Develop and evaluate neural network models to solve classification and regression problems.
CO5	Experiment with non-parametric and instance-based learning algorithms to analyze them Effectiveness infitting and predicting datapoints.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	1	1	1	1	1	2	1	2
CO2	3	3	3	2	2	2	1	1	2	2	2	3
CO3	3	3	3	2	2	2	1	1	2	2	2	3
CO4	3	3	3	2	2	2	1	1	2	2	2	3
CO5	3	3	3	2	2	2	1	1	2	2	2	2

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2
CO2	3	3	2	3
CO3	3	3	2	3
CO4	3	3	3	3
CO5	3	3	2	3

3/2/1Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	HumanitiesandsocialScience	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
									√

COURSE CODE	COURSE NAME	Artificial Intelligence and Machine Learning Lab	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24L01	Prerequisite:AI AND ML		Lb	0	0/0	3/0	1

MACHINE LEARNING LAB

1. Implement A* Search algorithm.
2. Implement AO* Search algorithm.
3. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
4. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
5. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
6. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
8. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
10. Build a simple NN models.
11. Build deep learning NN models.

Total Hours:45

COURSE CODE: EBML24I01	COURSE NAME: TECHNICAL SKILL I	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Nil	IE	0	0/0	2/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

Thestudents should be made to

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology

COURSE OUTCOMES (Cos): Students will be able to

CO1	Understand the domain specific knowledge.
CO2	Able to apply idealistic, practical and moral values.
CO3	Familiarize with emerging technology

Mapping of Course Outcomes with Program Outcomes (Pos):

Cos/Pos	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	2	2	1	1	1	3	1
CO2	3	3	2	3	3	2	2	2	2	2	3	1
CO3	3	3	3	3	3	2	2	1	2	2	3	1

Cos /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1
CO2	3	3	1	3
CO3	3	3	1	3

3/2/1indicates Strength of Correlation 3- High, 2- Medium, 1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
								✓	

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24I01	TECHNICAL SKILL I	IE	0	0/0	2/0	1

OBJECTIVES:

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology.

From the list of skill development courses declared by the department, the students are expected to acquire the skill and get certified. This will be evaluated at the end of the semester by the faculty.

DESCRIPTION:

Students should acquire skill in the domain/inter disciplinary area from government/private training centers/industries /University for a minimum period of 15 calendar days. The training can be through off line, online or mixed mode. Students are supposed to prepare technical skill report at the end of the training and submit the report along with the certificate in proof of the training, during the viva voce examination conducted by the examiners duly appointed by the head of the department

Total Hours:30

COURSE CODE EBCC22I06	COURSE NAME SOFT SKILL I - Employability skills	Ty/ Lb/ ETL	L	T/ S. Lr	P/R	C
	Prerequisite: NIL	IE	0	0/0	2/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL: Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To create awareness on top companies to improve their skill set matrix, and to develop a positive frame of mind.
- To help students be aware of various techniques of recruitment and also to prepare CV's and resume.
- To help student to face different types of interviews.
- To help students improve their verbal reading, narration and presentation skills.

COURSE OUTCOMES (COs) :(3- 5) Students will be able to

CO1	Be aware of various top companies leading to improve skills among students.
CO2	Be aware of various recruitment techniques like group discussion, interviews and CV's and resume writing.
CO3	Prepare for different types of interviews.
CO4	Improve their verbal, written and oral skills by performing mock sessions.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	2	2	3	2	3
CO2	1	1	1	1	1	1	1	2	2	3	2	3
CO3	1	1	1	1	1	1	1	2	2	3	2	3
CO4	1	1	1	1	1	1	1	2	2	3	2	3

COs / PSOs	PSO1	PSO2	PSO3
CO1	1	1	3
CO2	1	1	3
CO3	1	1	3
CO4	1	1	3

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low:

Category	Basic Sciences	Engineering Sciences	Humanities andSocialSciences	Program Core	Program Electives	Open Electives	Interdisp linary	Component Skill	Practical / Project
								✔	

Subject Code	Subject Name	Ty/ Lb/ ETL	L	T/ S. Lr	P/R	C
EBCC22I06	**SOFT SKILL I - Employability skills**	IE	0	0/0	2/0	1

OBJECTIVES:

- To create awareness on top companies to improve their skill set matrix, and to develop a positive frame of mind.
- To help students be aware of various techniques of recruitment and also to prepare CV's and resume.
- To help student to face different types of interviews.
- To help students improve their verbal reading, narration and presentation skills.

UNIT-I: **6 Hrs**

Creation of awareness of top companies / improving skill set matrix / Development of positive frame of mind / Creation of self-awareness.

UNIT-II: **6 Hrs**

Group Dos and don'ts – handling group discussions / what evaluators look for interpersonal relationships / Preparation of Curriculum Vitae / Resume.

UNIT-III: **6 Hrs**

Interview – awareness of facing questions – Do's and don'ts of personal interview / group interview, enabling students to prepare for different procedures such as HR interviews and Technical Interviews / self introductions.

UNIT-IV: **6 Hrs**

Verbal aptitude, Reading comprehension / narration / presentation / Mock Interviews.

UNIT-V: **6 Hrs**

Practical session on Group Discussion, Mock Interviews, Self Introduction and written tests on vocabulary and reading comprehension.

Total Hours: 30

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

COURSE CODE	COURSE NAME	DESIGN THINKING	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24ET2	Prerequisite:PYTHON		ETL	2	0/0	2/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to
Introduce students to the fundamental principles of Design Thinking and its relevance in AI/ML.
Develop problem-solving skills by fostering a human-centered approach to innovation.
Enhance creativity and critical thinking by enabling students to ideate and refine AI-driven solutions.
Equip students with methods to analyze user needs, formulate problem and develop solutions.
Provide an understanding of how Design Thinking complements AI and ML workflows.

COURSE OUTCOMES (Cos): Students will be able to

CO1	Explain the core concepts, principles, and significance
CO2	Apply user research techniques such as empathy mapping and persona creation
CO3	Demonstrate creative problem-solving by generating innovative ideas
CO4	Develop functional prototypes, test solutions, and refine them
CO5	Integrate Design Thinking methodologies into AI/ML development

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	1	1	1		2		3
CO2	3	3	2	2	2	1	1	1	2	1	3
CO3	2	3	3	2	2	1	1	1	3	2	3
CO4	2	3	3	3	3	2	1	1	3	2	3
CO5	2	2	3	2	3	3	3	1	2	2	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	1	2
CO2	3	2	2
CO3	2	3	2
CO4	3	3	3
CO5	2	3	3

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical / Project
				√					

COURSE CODE	COURSE NAME	DESIGN THINKING	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24ET2	Prerequisite: PYTHON		ETL	2	0/0	2/0	3

Unit I Introduction to Design Thinking 9 Hrs

Overview of Design Thinking: Definitions and significance in engineering and technology - Historical evolution and key principles of Design Thinking - The role of Design Thinking in fostering innovation within AI and Machine Learning - Case studies highlighting successful applications in technology sectors

Unit II Empathy and Problem Definition 9 Hrs

Understanding user-centric design: Techniques to gain deep user insights - Methods for effective user research and data collection - Developing empathy maps and user personas - Formulating clear problem statements and "How Might We" questions.

Unit III Ideation and Prototyping 9 Hrs

Divergent and convergent thinking strategies - Facilitating brainstorming sessions to generate innovative ideas - Introduction to rapid prototyping: Tools and techniques - Iterative design processes and refining prototypes based on feedback.

Unit IV Testing and Implementation 9 Hrs

Designing effective testing protocols for prototypes - Collecting and analyzing user feedback to inform design improvements - Strategies for scaling prototypes into deployable solutions - Challenges and best practices in implementing design solutions in AI and Machine Learning projects.

Unit V Design Thinking in AI and Machine Learning 9 Hrs

Integrating Design Thinking methodologies into AI and Machine Learning workflows - Ethical considerations and human-centered AI design - Exploring the impact of Design Thinking on AI-driven product development - Future trends: The evolving relationship between Design Thinking and emerging technologies.

Text book:

[1] Teun den Dekker, Design Thinking, 1st Routledge-Noordhoff International ed. Groningen, Netherlands: Routledge, 2020

References:

[1] A. Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone, 1st ed. New York, NY, USA: Routledge, 2019.

DESIGN THINKING LABORATORY (15 Hrs) **Total Hrs: 60**

SOFTWARE SPECIFICATION (Common to All Programs):

- **OS**: Windows 10 or later / Ubuntu 20.04+ / macOS
- **Python Version**: 3.8+
- **IDE**: VS Code / Jupyter Notebook / PyCharm Community Edition
- **Required Libraries**:
  - pandas (for data handling)
  - matplotlib or seaborn (for visualization)
  - sklearn (basic ML)
  - tkinter (for simple GUIs)
  - streamlit (optional - for quick web-based prototyping)

pip install pandas matplotlib seaborn scikit-learn streamlit

PROGRAM 1: Empathy Mapping App (Text-Based UI)
Objective: Create a simple text-based program that asks users questions to generate an empathy map.

PROGRAM 2: User Persona Generator (Data-Driven)
Objective: Read a CSV file of user data and generate summary personas.

PROGRAM 3: Idea Rating and Sorting Tool
Objective: Allow users to enter ideas and rate them based on feasibility and impact.

PROGRAM 4: Rapid Prototyping UI (with Tkinter)
Objective: Create a simple GUI that mimics part of a product (e.g., a chatbot input box or feedback form)

PROGRAM 5: Feedback Collection and Analysis Tool
Objective: Collect user feedback and perform sentiment classification (basic ML)

COURSE CODE	COURSE NAME	NATURAL LANGUAGE PROCESSING	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24ET3	**Prerequisite: Deep Learning / Machine Learning**		ETL	2	0/0	2/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To introduce the fundamental concepts of Natural Language Processing
To teach linguistic and statistical approaches to language processing
To develop skills in text preprocessing and feature extraction
To explore key NLP applications and tasks
To introduce modern NLP techniques using machine learning and deep learning

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand the foundational concepts of Natural Language Processing and basic linguistic structures.
CO2	Apply text preprocessing techniques such as tokenization, stemming, lemmatization, and stopword removal.
CO3	Represent text data using traditional and modern vectorization techniques such as Bag of Words, TF-IDF, and Word Embeddings.
CO4	Implement basic NLP tasks such as part-of-speech tagging, named entity recognition, and syntactic parsing.
CO5	Develop NLP applications using machine learning and deep learning models for tasks like text classification and sentiment analysis.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	1	2	1	-	1	-
CO2	3	2	3	2	2	2	2	1	1	2	1
CO3	3	2	2	1	2	3	-	2	1	1	-
CO4	2	3	2	2	3	2	2	3	2	3	2
CO5	3	3	3	2	1	2	1	3	2	2	2

COs/PSOs			
CO1	PSO1	PSO2	PSO3
CO2	2	2	2
CO3	3	2	3
CO4	2	3	2
CO5	2	3	2

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	HumanitiesandsocialScience	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
				√					

COURSE CODE	COURSE NAME	NATURAL LANGUAGE PROCESSING	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24ET3	**Prerequisite: Deep Learning/ Machine Learning**		ETL	2	0/0	2/0	3

UnitI Introduction **9 Hrs**

Language and Linguistics, Ambiguity and Layers of NLP, Grammerprabability of Data, Generations of NLP. Generation 1: Belongingness via Grammers, Generation 2: Discrete Representational Semantics.Generation3: Dense Representation

Unit II Shallow Parsing **9 Hrs**

Parts-of-speech Tagging, Statistical POS Tagging, Neural POS Tagging, Chunking, Deep Parsing Linhuistics of Parsing, Algorithmics ofParsing, Constituency Parsing-Rule Based, Statistical Parsing

Unit III Named Entity Recognition **9 Hrs**

ProblemFormulation, AmbigityinNamedEntityRecognition, Dataset, FirstGeneration -Rule basedapproches, SecondGeneration-ProbabilisticModels, ThirdGeneration- Sentence Representation Position Wise Labelling, Implication to other NLP Problem

Unit IV Natural Language Inference **9 Hrs**

Ambiguity in NLP, Problem Formulation, Datasets, Logical Reasoning, Alignment, Neural Approches, Machine Translation, Rule Based Machine Translation, Indian LanguageStatisticalMachineTranslation, PharseBased Statistical MachineTranslation

UnitV Sentiment Analysis **9 Hrs**

Problem Statement, ambiguity for Sentiment Analysis, Lexicons for SentimentAnalysis, Rule based Sentiment Analysis, Statistical Sentiment Analysis, Neuralapproches, Sentiment Analysis in different languages.

Textbook:

1.Pushpak Bhattacharyya and Aditya Joshi, Natural Language Processing by Wiley India Pvt. Ltd., Edition:2023ISBN:978-93-5746-238-9

NLP PROGRAM USING PYTHON : (15 Hrs) **Total Hours: 60**
(with nlp libraries like nltk, spacy, and textblob)

1. Tokenization with NLTK
2. Stop Words Removal
3. Part-of-Speech (POS) Tagging with NLTK
4. Named Entity Recognition (NER) with spaCy
5. Sentiment Analysis with TextBlob
6. Lemmatization with spaCy
7. Bag of Words Model with Scikit-Learn

V SEMESTER

COURSE CODE: EBML24001	COURSENAME: COMPUTER ARCHITECTURE	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial, S. Lr: Supervised Learning, P: Project, R: ResearchC: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Conceptualize the major components of a computer including CPU, memory, I/O and storage, understand the uses for cache memory,
- Analyze digital logic and computer arithmetic operations.
- Understand the pipelining, vector processing, multi core architectures and parallel computing models.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand the theoretical basics of central processing unit.
CO2	Understand the Digital Logic and Floating-Point Arithmetic.
CO3	Analyze Data Transfer Mechanisms.
CO4	Explore Advanced Processor and Memory Architectures.
CO5	Understand the Multi-Core Architectures.

Mapping of Course Outcomes with Program Outcomes (Pos):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	1	1	1			2			2
CO2	3	3	3	2	1			2			2
CO3	3	2	1	3	2			2			2
CO4	3	3	3	2	2			2			2
CO5	3	2	3	3	2			2		1	2

Cos / PSOs	PSO1	PSO2	PSO3
CO1	1	1	
CO2	1	1	
CO3	1	1	2
CO4	3	2	2
CO5	3	3	3

3/2/1Indicates Strength of Correlation ,3–High, 2-Medium,1-Low:

Category	BasicScience	EngineeringScience	Humanitiesandsocial Science	ProgramCore	Programelective	OpenElective	Inter Disciplinary	Skill Component	Practical/Project		
				✓							

COURSE CODE	COURSENAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24001	COMPUTER ARCHITECTURE	Ty	3	0/0	0/0	3

UNIT-I: BASIC STRUCTURE OF COMPUTERS: 9 Hrs

Basic functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set, CISC and RISC architecture.

UNIT-II: DIGITAL LOGIC AND COMPUTER ARITHMETIC: 9 Hrs

Boolean Algebra, Gates, combination circuits, Sequential circuits. Data representation: signed number representation, fixed and floating-point representations, Computer arithmetic – integer addition and subtraction, multiplication –Booth multiplier, carry save multiplier, Division – non- restoring and restoring techniques.

UNIT-III: INPUT/OUTPUT AND PERIPHERALS: 9 Hrs

Input-output interfaces, Asynchronous data transfer, Direct memory access (DMA), Interrupt: program controlled, interrupt driven, privileged and non- privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions.

UNIT-IV: PROCESSOR AND MEMORY SYSTEM: 9 Hrs

Hardwired control – micro programmed control, nano programming, pipelining, vector processing, hazards andsuper scalar architecture ,VLIW architecture. Memory hierarchy- shared memory organizations,cache memory management techniques, Virtual memory technology.

UNIT-V: MULTI-CORE PROCESSOR ARCHITECTURES AND PARALLEL COMPUTING: 9 Hrs

Symmetric and Asymmetric Multicore Architectures, Instruction-Level Parallelism (ILP), Thread-Level Parallelism (TLP), Simultaneous Multithreading (SMT). Parallel Programming Models: OpenMP, MPI, CUDA, and OpenCL. Case Studies: Intel, AMD, ARM, RISC-V Multi core Processors.

Total Hours: 45

TEXT BOOKS:

1. Kai Hwang, NareshJotwani “Advanced computer architecture paralllesim, scalability, programmability third edition”, Tata McGraw Hill, 2017.

REFERENCE BOOKS:

1. William stallings “Computer organization and architecture designing for performance”, pearson ,2022 11th Edition.
2. Morris Mano “Computer System Architecture, Pearson Education”, (2017) 3rd Edition.
3. John Shen & Mikko Lipasti Modern Processor Design: Fundamentals of Super scalar Processors Wave land press 2013 2nd Edition.

COURSE CODE: EBML24002	COURSENAME: ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING	Ty/Lb/ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Project, R: Research, C: CreditsTy/Lb/ETL/IE: Theory/ Lab/Embedded Theory and Lab

OBJECTIVES:

The students should be made to:

1. Understand major deep neural network frameworks and issues in basic neural Networks.
2. Understand the neural network models.
3. Able to design and develop applications using Neural Networks.
4. To solve real-world applications using Deep learning.
5. Providing insight into recent Deep Learning architectures.

COURSE OUTCOMES(COs): Students will be able to

CO1	Understand the fundamental principles of artificial neural networks.
CO2	Understand and visualize Convolutional Neural Network for real-world applications
CO3	Understand the methods and terminologies involved in deep neural network
CO4	Identify and apply appropriate deep learning algorithms for analyzing the data for variety of problems.
CO5	To demonstrate the use of Recurrent Neural Networks and Transformer based for language modeling.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	1	2	1	-	1	-
CO2	3	2	3	2	2	2	2	1	1	2	1
CO3	3	2	2	1	2	3	-	2	1	1	-
CO4	2	3	2	2	3	2	2	3	2	3	2
CO5	3	3	3	2	1	2	1	3	2	2	2

COs /PSOs	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	3	2	3
CO3	2	3	2
CO4	2	3	2
CO5	3	3	3

3/2/1Indicates Strength of Correlation ,3– High,2-Medium,1-Low:

Category	BasicScience	EngineeringScience	Humanities andsocialScience	ProgramCore	Programelective	Open Elective	InterDisciplinary	SkillComponent	Practical /Project			
				✓								

COURSECODE	COURSENAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24002	ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING	Ty	3	0/0	0/0	3

Unit-1: Introduction to Artificial Neural Networks : 9 Hrs

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

Unit-2: Fundamental Models of Artificial Neural Networks : 9 Hrs

Introduction, McCulloch – PittsNeuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square Rule, Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.PerceptronNetworks: Introduction, Single Layer Perceptron, Brief Introduction toMultilayer Perceptron Networks.

Unit-3: Adaline, Madaline and Feed Forward Networks: 9 Hrs

Introduction, Adeline, Madeline.Associative Memory Networks: Introduction, Algorithms for Pattern Association, HeteroAssociative Memory Neural Networks, Auto Associative Memory Network, Bi-directionalAssociativeMemory.Feedback Networks: Introduction, Discrete Hop filed Net, Continuous Hop filed Net, Relation between BAM and Hop filed Nets.Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial BasisFunction Network (RBFN).

Unit-4: Deep Learning Architectures: 9 Hrs

Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications

Unit-5: Convolutional Neural Networks and Transfer Learning: 9 Hrs

Architectural Overview, Motivation, Layers, Filters, Parameter sharing, Regularization, Popular CNN Architectures: ResNet, AlexNet – Applications. Transfer learning Techniques, Variants of CNN: DenseNet, PixelNet. Deep Belief networks, Boltzmann Machines, Deep Boltzmann Machine, Generative Adversial Networks.

Total Hours:45

TEXT BOOKS:

1. Christopher M. Bishop with hugh Bishop," Deep Learning Foundations and Concepts", Springer, 2024.
2. Charu Aggarwal, "Neural Networks and Deep Learning: A Textbook", 2021.

REFERENCE BOOKS:

1. Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep Learning", MIT Press, 2017.
2. Michael A. Nielsen, "Neural Networks and Deep Learning", Determination press, 2015.
3. Sivanandam, S Sumathi, S N Deepa; "Introduction to Neural Networks", 2nd ed., TATA McGraw HILL: 2005.
4. Simon Haykin, "Neural networks A comprehensive foundations", 2nd edition, Pearson Education, 2004.
5. B Yegnanarayana, "Artificial neural networks", 1st ed., Prentice Hall of India P Ltd,2005.
6. Li Min Fu, "Neural networks in Computer intelligence", 1st ed., TMH, 2003.

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBOL22I01	**ONLINE COURSE (NPTEL/ SWAYAM /Any MOOC approved by AICTE/UGC))**	IE	1	0/0	1/0	1

Students should register for the online course with a minimum course duration of 4weeks through the online portals such as NPTEL/SWAYAM/Any MOOC in the beginning of the semester. A mentor will be assigned by the department for monitoring the students.

Students are expected to attend the online classes regularly and submit the weekly assignments before the due dates. Students should appear for the online examination and submit the certificate at the end of the semester. Internal Examination will be conducted by the examiners duly appointed by the head of the department.

Total Hours:30

COURSE CODE	COURSE NAME	SOFTWARE ENGINEERING AND SYSTEM DEVELOPMENT	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24003	**Prerequisite: Basic Programming and Data Structures, Software Development Fundamentals, Basic Networking and Cloud Concepts**		TY	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to
To Understand Software Development Processes and Best Practices, Develop Skills in Software Design, Quality Assurance, and Project Management and Adopt Modern Development Practices with DevOps and Agile.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand the Fundamentals of Software Engineering and the Software Development Life Cycle (SDLC)
CO2	Analyze and Model Software Requirements for Effective Design and Development
CO3	Ensure Software Quality through Effective Practices and Project ManagementTechniques
CO4	Implement DevOps Practices, Infrastructure Automation, and Continuous Integration
CO5	Apply Agile Methodologies to Software Development and Process Improvement

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	2	1	-	-	-	-	2
CO2	3	3	3	2	2	-	-	-	2	2	2
CO3	2	3	3	3	2	1	3	2	2	3	2
CO4	2	2	3	3	3	1	-	2	2	3	2
CO5	2	2	3	2	3	1	-	3	3	3	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	1	1
CO2	3	2	1
CO3	3	3	2
CO4	3	2	3
CO5	3	2	3

3/2/1Indicates Strength of Correlation, 3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	HumanitiesandsocialScience	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
				√					

COURSE CODE	COURSE NAME	SOFTWARE ENGINEERING AND SYSTEM DEVELOPMENT	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24003	**Prerequisite: Basic Programming and Data Structures, Software Development Fundamentals, Basic Networking and Cloud Concepts**		TY	3	0/0	0/0	3

UnitI Introduction to Software Engineering **9 Hrs**

Software Engineering: Defining the discipline, The Software Process, Software Engineering Practice, Software Development Life Cycle (SDLC), Process models: A Generic Process Model, defining a Framework, Identifying a TaskSet, Process Assessment and improvement, Prescriptive Process Models, ProductandProcess

Unit II Requirement Modelling **9 Hrs**

Requirement Analysis, Scenario- Based Modeling, Class - Based Modeling, Functional Modeling, Behavioral Modeling. Design Concepts: Design within the context of Software Engineering, The Design Process, Design Concepts, The Design Model. Architectural Design: Software Architecture, Agility and Architecture, Architectural Styles, Architectural Decisions, Architectural Design.

Unit III Software Quality and Project Management **9 Hrs**

Software Quality, The Software Quality Dilemma, Achieving Software Quality. Project Management Concepts: The management Spectrum, The People, The Product, TheProcess, TheProject.Software Quality Assurance.

Unit IV DevOps and Infrastructure As Code **9 Hrs**

DevopsCulture And Infrastructure as Code Practices, Provisioning Cloud Infrastructure with Terraform, Using Ansible for Configuring IaaS Infrastructure, Managing your Source Code with Git, Continuous Integration and Continuous Delivery

Unit V Agile and Process **9 Hrs**

Agility and the cost of coverage, Agile Process, Scrum, Other Agile Frameworks, AgilePractices, Overview of Extreme Programming, Planning, Testing, Refactoring

Total Hours:45

Textbook:

1. S. Pressmen Software Engineering: A Practitioner's Approach, 9th ed.NewYork, NY, USA: McGraw Hill,2020
2.R.M. Krief, LearningDevOps-SecondEdition, 2nded.Birmingham, UK-Packt Publishing 2022

References:

1. C.Martin, AgileSoftwareDevelopment, Principles, Patterns, andPractices,8thed, Upper SaddleRiver, NJUSA-PrenticeHall2021

COURSE CODE: EBML24L02	COURSE NAME: SOFTWARE ENGINEERING LAB	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: OBJECT ORIENTED PROGRAMMING WITH C++	Lb	0	0/0	3/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Design and implement complex software solutions using software engineering techniques
- Understand working knowledge of Unified Modeling Language (UML) Sources Control
- Identify Use Cases and develop Use Case Model
- Identify Conceptual Classes and develop a domain model with UML Class Diagram
- Understand the interaction between objects and represent them using UML Interaction Diagrams.

COURSE OUTCOMES (COs): Students will be able to

CO1	Analyze and design solutions for complex projects[L4]
CO2	Apply the appropriate notation to construct various UML Models[L3]
CO3	Understand the importance of Systems Analysis and Design in solving complex problems[L2]
CO4	Evaluate the difference between Object-Oriented Approach and Traditional Approach [L5]
CO5	Apply the role and function of each UML Model in developing object-oriented software[L3]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	2	1	1	2	3	2	2	3
CO2	2	3	1	2	3	3	2	1	2	2	1	3
CO3	3	2	2	1	2	2	2	2	2	3	1	2
CO4	3	3	1	2	3	2	1	3	3	2	1	3
CO5	1	2	2	2	1	2	2	1	2	3	2	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2
CO2	3	3	3	3
CO3	2	3	2	2
CO4	1	2	1	3
CO5	2	1	3	2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
									✓			

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24L02	SOFTWARE ENGINEERING LAB	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

1. Study of Case tools such as Rational Rose or Equivalent Tools
2. Student Result Management System
3. Inventory Control System
4. Railway Reservation System
5. Hotel Management System
6. Automating Banking Process
7. Library Management System
8. Passport Automation System
9. E-Ticketing

SOFTWARE REQUIRED:

Languages: C/C++/JDK 1.3, JSDK, WEB BROWSER & UML

Any Front-End Tools (Like VB, VC++, Developer 2000)

Any Back End Tools (Like Oracle, MS-Access, SQL, DB2)

Modelling and Design: Rational Rose

Total Hours:45

COURSE CODE: EBML24L03	COURSE NAME: ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING LAB	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
		Lb	0	0/0	3/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to
- To understand the fundamentals of artificial neural networks (ANN)
- To implement basic neural network models from scratch
- To develop skills in using deep learning frameworks
- To train, validate, and test deep learning models on real-world datasets
- To explore and compare various deep learning architectures

COURSE OUTCOMES (COs): Students will be able to

CO1	Implement fundamental artificial neural network models such as perceptron and multilayer perceptron using programming languages and frameworks.
CO2	Apply back propagation and optimization techniques to train deep learning models effectively.
CO3	Design, build, and evaluate convolutional neural networks (CNNs) for image classification tasks.
CO4	Develop and deploy deep learning models using popular libraries such as TensorFlow or PyTorch for real-world problems.
CO5	Analyze the performance of deep learning models using appropriate metrics and fine-tuning strategies.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	2	1	1	2	3	2	2	3
CO2	2	3	1	2	3	3	2	1	2	2	1	3
CO3	3	2	2	1	2	2	2	2	2	3	1	2
CO4	3	3	1	2	3	2	1	3	3	2	1	3
CO5	1	2	2	2	1	2	2	1	2	3	2	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2
CO2	3	3	3	3
CO3	2	3	2	2
CO4	1	2	1	3
CO5	2	1	3	2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
									✓			

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24L03	**ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING LAB**	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

1. Implement Perceptron Algorithm
2. Implement Multi-Layer Perceptron (MLP)
3. Explore Activation Functions
4. Train a Neural Network on MNIST Dataset
5. Implement Backpropagation Algorithm (using NumPy)
6. Build a Convolutional Neural Network (CNN)
7. Apply Dropout for Regularization
8. Evaluate Model Using Confusion Matrix and Accuracy
9. Train a Recurrent Neural Network (RNN) or LSTM
10. Use Transfer Learning with Pretrained Models

Total Hours:45

COURSE CODE:	COURSE NAME: TECHNICAL SKILL II	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24I02	**Prerequisite: Nil**	IE	0	0/0	2/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the domain specific knowledge.
CO2	Able to apply idealistic, practical and moral values.
CO3	Familiarize with emerging technology

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	2	2	1	1	1	3	1
CO2	3	3	2	3	3	2	2	2	2	2	3	1
CO3	3	3	3	3	3	2	2	1	2	2	3	1

COs /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1
CO2	3	3	1	3
CO3	3	3	1	3

3/2/1indicates Strength of Correlation, 3- High, 2- Medium, 1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
								✔	

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24I02	TECHNICAL SKILL II	IE	0	0/0	2/0	1

OBJECTIVES:

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology.

From the list of skill development courses declared by the department, the students are expected to acquire the skill and get certified. This will be evaluated at the end of the semester by the faculty.

DESCRIPTION:

Students should acquire skill in the domain/inter disciplinary area from government/private training centers/industries /University for a minimum period of 15 calendar days. The training can be through off line, online or mixed mode. Students are supposed to prepare technical skill report at the end of the training and submit the report along with the certificate in proof of the training, during the viva voce examination conducted by the examiners duly appointed by the head of the department.

Total Hours: 30

COURSE CODE	COURSE NAME	BIO INSPIRED ALGORITHMS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24ET4	Prerequisite: DESIGN AND ANALYSIS OF ALGORITHM		ETL	2	0/0	2/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

Know about bio inspired algorithms learn
about Meta heuristics Algorithms Learn the
basics of Genetic Algorithm learn the
basics of Swarm Intelligence
Learn various applications of Bio Inspired Algorithms

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand about various bio inspired algorithms [L1]
CO2	Understand about Meta Heuristics Algorithms [L4]
CO3	Apply Genetic algorithm for optimization problems [L4]
CO4	Understand and implement various swarm optimization techniques [L1]
CO5	Apply Bio Inspired algorithms in various engineering fields [L4]

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	-	-	-	-	-	-	1
CO2	3	2	2	1	1	-	-	-	-	-	1
CO3	3	3	3	2	2	1	-	-	-	-	-
CO4	3	2	2	1	-	-	-	-	-	-	1
CO5	3	2	1	1	2	1	-	-	-	-	-

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	3	2	2
CO3	3	2	3
CO4	1	2	1
CO5	3	2	3

3/2/1Indicates Strength of Correlation, 3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	HumanitiesandSocialScience	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
				√					

COURSE CODE	COURSE NAME	BIO INSPIRED ALGORITHMS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24ET4	Prerequisite: DESIGN AND ANALYSIS OF ALGORITHM		ETL	2	0/0	2/0	3

Unit I Introduction to Bio Inspired Algorithms **9 Hrs**

Bio-inspired and evolutionary algorithms - Particle Swarm Optimization (PSO) - Artificial Bee Colony Algorithm (ABC) - Micro Artificial Bee Colony Algorithm - Differential Evolution - Bacterial Foraging Optimization Algorithm

Unit II Introduction to Meta heuristics **9 Hrs**

Metaheuristics- The Bio Inspired Zoo - Simulated Annealing (SA) - Eagle strategy- Annealing and Boltzmann Distribution - Firefly Algorithm (FA) - Grey Wolf Optimization (GWO)

Unit III Genetic Algorithms **9 Hrs**

Genetic algorithms–Representation–Reproduction–Crossover and Mutation Operators –Crossover and Mutationrates–Selection mechanisms–Fitness proportionate–ranking and tournament selection – Building Block – Hypothesis and Schema Theorem

Unit IV Swarm Intelligence **9 Hrs**

Swarm Intelligence – Stigmergy – Competition and Cooperation – Particle Swarm Optimization– Anatomy ofa particle– Velocity and Positionupdation– PSOtopologies –Control parameters– AntColonyOptimization (ACO)–Pheromone updation and evaporation.

Unit V Applications of Bio Inspired Algorithms **9 Hrs**

Solving Optimization Problems in Wireless Networks Using Genetic Algorithms- Swarming Agents for Decentralized Clustering in Spatial Data -Advanced Evolutionary Algorithms for Training Neural Networks.Bio-Inspired Data Mining.Evolutionary Algorithm for Knowledge Discovery in Microarray Experiments

Textbook:

1. "Bio-inspired Algorithms for Engineering", Nancy Arana-Daniel, CarlosLopez-Franco, AlmaY Alanis, Butterworth-Heinemann publishing;1stedition,2023

References:

1. "Biologically Inspired Optimization Methods -An Introduction", Mattias Wahde, WITPress, 2018
2. "Bio-Inspired Engineering", ChristopherH.M. Jenkins, Momentum Press, 2012
3. Xin-SheYang, JaaoPaulo papa, "Bio-Inspired Computing and Applications in Image Processing", Elsevier 2020
4. Xin-SheYang,"Nature Ispired Optimization Algorithm, Elsevier First Edition 2018
5. Yang, Cui, XIao, Gandomi, Karamanoglu,"Swarm Intelligence and Bio-Inspired Computing", Elsevier First Edition 2013

BIO-Inspired Lab: (15 Hrs) **Total Hrs : 60**

1. Genetic Algorithm (GA) — Maximize $f(x) = x^2$
2. Particle Swarm Optimization (PSO) — Minimize $f(x) = (x-5)^2$
3. Ant Colony Optimization (ACO) — Shortest Path on Simple Graph
4. Artificial Bee Colony (ABC) — Minimize Sphere Function
5. Firefly Algorithm — Minimize $f(x) = x^2$
6. Differential Evolution (DE) — Minimize Sphere Function
7. Bat Algorithm — Minimize $f(x) = x^2$

COURSE CODE:	COURSE NAME: FOREIGN LANGUAGE - II	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBFL23IXX	Prerequisite: NIL	IE	1	0/0	1/0	1

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE:

The students should be made to

- To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakers of that language.

COURSE OUTCOMES (COs): Students will be able to

CO1	Achieve functional proficiency in listening, speaking, reading, and writing.
CO2	Develop an insight into the nature of language itself, the process of language and culture acquisition.
CO3	Decode, analyze, and interpret authentic texts of different genres.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1				1				2	3	2	2
CO2	1				1	1	1	1	2	2	1	3
CO3	2	1			1			1	2	3	1	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	
CO2	3	3	3	2
CO3	3		3	2

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
			✓									

COURSE CODE:	COURSE NAME: FOREIGN LANGUAGE - II	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBFL23IXX	Prerequisite: NIL	IE	1	0/0	1/0	1

OBJECTIVE:

To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakersof that language

DESCRIPTION:

Foreign language is introduced in the curriculum to make the students globally employable. Students should select and register for any one of the foreign languages from the given list. At the end of the course students should be able to read, write and converse the language in the basic level. At the end of the semester the assessment will be done through internal examination by the examiner duly appointed by the head of the department.

S.NO	COURSE CODE	COURSE NAME
1	EBFL23I08	FRENCH-II
2	EBFL23I09	GERMAN-II
3	EBFL23I10	JAPANESE-II
4	EBFL23I11	ARABIC-II
5	EBFL23I12	CHINESE-II
6	EBFL23I13	RUSSIAN-II
7	EBFL23I14	SPANISH-II

Total Hours:30

VI SEMESTER

COURSE CODE	COURSE NAME	GENERATIVE AI	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24004	Prerequisite: Artificial Intelligence		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to:

-Understand and implement Generative Models
-Apply Generative AI for Real world Problems
-Optimize and innovate with Generative AI

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand the evolution of AI and the significance of Deep Learning.
CO2	Apply various Neural Network architectures for tasks like image recognition and sequence Modeling
CO3	Analyze data preprocessing and training techniques for neural networks
CO4	Apply the GPT model for natural language processing tasks.
CO5	Design practical solutions using advanced neural networks for diverse applications.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	1	3	1	-	-	-	1	1
CO2	3	2	3	1	3	1	-	2	2	1	1
CO3	2	3	2	3	3	1	-	-	1	1	3
CO4	3	2	3	1	3	2	-	-	-	2	1
CO5	3	2	3	1	3	2	-	2	-	2	1

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	2	2
CO2	3	2	2
CO3	2	3	3
CO4	3	3	3
CO5	2	3	3

3/2/1Indicates Strength of Correlation, 3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	HumanitiesandsocialScience	Program Core	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
	-	-	-	√	-	-	-	-	-

COURSE CODE	COURSE NAME	GENERATIVE AI	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24004	Prerequisite: Artificial Intelligence		Ty	3	0/0	0/0	3

Unit I Foundations of AI and Neural Networks **9 Hrs**

History and evolution of AI/ML, Deep learning revolution, Transfer learning, History of Neural Natural Language Processing, Structure of Artificial Neural Networks, Steps in Training an Artificial Neural Network, Parameters and Hyper parameters, Backpropagation.

Unit II Advanced Neural Network Architectures **9 Hrs**

Introduction to advanced architectures, Introduction to Generative AI Models: Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), Transformers, Attention Mechanism in detail Long Short-Term Memory Networks (LSTMs).

Unit III Data Preprocessing **9 Hrs**

Probability and Statistics, Data Preprocessing Techniques, Model Training Techniques, Generative AI Applications: Applications in Various Fields: Art and Creativity, Image and Video Generation, Text Generation, Music Composition, Healthcare Finance.Real - world use cases and challenges in deploying generative AI models

Unit IV GPT Models and Applications **9 Hrs**

A Study of GPT architecture and variants. Applications of GPT models in text generation and dialogue systems. Case study-based implementation of GPT-based tasks. GPT-based chatbot enhances E-Shop's customer support service

Unit V Applications and Future Directions **9 Hrs**

Real-world applications of large language models. Challenges and limitations of current approaches. Emerging trends and future directions in Generative AI

Total Hrs: 45

Text book:

1. Henrik Kniberg, Altaf Rehmani, “Generative AI in a nutshell: How to survive and thrive in age of AI". Henrik Kniberg, Altaf Rehmani, 1st edition (12 February 2024)

References:

1. Numa Dhamani, "Introduction to Generative AI”, Kindle Edition, 2024.
2. Charu C. Aggarwal"Generative Adversarial Networks Cookbook: Over 100 recipes to build generative models using Python, TensorFlow, and Keras" 2018.
3. Jesse, “Generative AI in Software Development: Beyond the Limitations of Traditional Coding” Sprinter, 2024.

COURSE CODE	COURSE NAME	Artificial Intelligence and Machine Learning Tools	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24005	Prerequisite: Mathematics/ DataStructures		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand and identify the purpose and features of AI tools.

To apply the tools to specific use such as Design, Image, Video and Presentation.

To learn about pre-training and transfer learning in NLP

To study the fundamentals of computer vision

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understanding the Artificial Intelligence Tools for different purposes
CO2	Evaluate and apply the AI Tools to produce impactful visual designing for personal, business or marketing purposes as well as for creating functional software code efficiently.
CO3	Create effective presentations using AI tools for different audiences
CO4	Develop machine learning models using Tensor flow and Keras, incorporating concepts like activation functions, layers, and neural networks
CO5	Implement computer vision techniques for image classification, object detection, and Feature extraction to solve practical image-related problems

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	3	1	1	2	2	1	3
CO2	3	3	3	2	3	2	1	3	3	2	3
CO3	2	2	3	2	3	2	1	3	3	2	3
CO4	3	3	3	3	3	1	1	2	2	2	3
CO5	3	3	3	3	3	2	1	2	2	1	3

COs/PSOs	PSO1	PSO2	PSO3	
CO1	2	2	3	
CO2	2	3	3	
CO3	1	2	3	
CO4	3	3	3	
CO5	3	3	3	

3/2/1Indicates Strength of Correlation, 3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	HumanitiesandsocialScience	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
				√					

COURSE CODE	COURSE NAME	Artificial Intelligence and Machine Learning Tools	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24005	Prerequisite: Mathematics/DataStructures		Ty	3	0/0	0/0	3

Unit I Content and Code Generation Tools **9 Hrs**

Content Writing Tools: Ryr, Sudowrite, Chatgpt, Grammerly, wordtune, anyword, Jasper, Claude, Writesonic, Teal. Code Generation Tools: Cogram, Code5T, OpenAi, Codex, Codeium, Polycoder, Bubble, Bolt, Lovable, Cursor, Softr, Wix. Content
DetectorTool: Hive.

Unit II Image, Photo, Video and DesignTools **9 Hrs**

Image Tools: Midjourney, DALL.E 3. Photo Tools: Pixlr, Remini, Luminea Neo, remix. Video Tools: Synthesia, Runway, Filmora, OpusClip, Flikki, Lumiere. Design Tools: Canva, magic, Studio, Looka. Voice Generation Tools: ElevenLabs, Murf

Unit III Research, Slide presentation Tools **9 Hrs**

Research Tools: Deep research, researchrabbit.at, Rytr, Perplexity, Connected Papers, DeepMind, AI21 Labs. Slide Presentation Tools: Gamma, Presentations.ai, SlideAi.io, Unite AI, Prezzo, Slidesgo, Slidequest, Slidebean. Meeting Tools: Fathom, Nyota

Unit IV Machine Learning and Computer Vision **9 Hrs**

Machine Learning: Forms of Learning, Types of Learning: Supervised Learning, Unsupervised Learning, Transferlearning and Reinforcement learning. Generalization in Reinforcement learning, Applications ofReinforcement learning. Computer Vision, Image Formation, Image Features, Classifying Images, Detecting Objects, the 3D world, Using Computer Vision. Tensor Flow and Keras: Keras Framework, Sequential Mode, Activation Functions, Layers, Training, Building ANN using TF

Unit V Deep Learning **9 Hrs**

Deep Learning for NLP: Word Embeddings, Recurrent Neural Networks for NLP, Sequence-to-Sequence Models, Transformer Architecture, Pre-training and Transfer Learning.Robotics: Robots, Robot Hardware, Robotic Perception, Human Robots, Alternative Robotic Frameworks, Application Domains

Total Hours: 45

Text book:

1. Dr.AmeyPangarkar, Dr.BhooshanKelkar, MadhaviNadkarni,"AITools-YouCan'tdo Without(Artificial Intelligence), Neuflex Talent Sol. P. Ltd, 2024
2. StuartJ.Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" Fourth Edition, Pearson India Edu.ServicesPvt.Ltd.2022

References:

1. Mark Pesce, GrantWright, "Getting Started with ChatGPT and AI Chatbots: An Introduction to generative AI Tools" Kindle Edition, 2023.
2. TomTaulli, "Generative AI: How ChatGPT and Other AI Tools will revolutionize Business" Apress, 2023.
3. Hannele Niemi, RoyD.Pea, YuLu "AIin Learning: Designing the Future", Springer,2022. ShalinHai-Jew, "Making Art with Generative AI Tools", IGI Global,2024.
4. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", Third Edition byShaoff/O'Reilly2022.

Subject Code: EBCS22007	COURSE NAME: COMPUTER NETWORKS	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: OPERATING SYSTEMS	Ty	3	0/0	0/0	3

L: LectureT: Tutorial S. Lr: SupervisedLearning P: Project R: Research C: Credits
T/L/ETL/IE: Theory/Lab/EmbeddedTheoryandLab/Internal Evaluation

OBJECTIVE:

The students should be made to

- Remember how the networks functions take place
- Understand how communication takes place in various mediums
- Learn about the protocols for data communication in the network layers
- Study about the various network algorithms for smooth data communication

COURSE OUTCOMES (COs: Students will be able to

CO1	Students will understandand remember how network works. [L2]
CO2	Students will have knowledge on Ip address and analyze the protocols. [L1]
CO3	Apply knowledge about protocols to avoid congestion. [L3]
CO4	Acquaintance to apply algorithms in networks. [L4]
CO5	Will understand how layers of networks work. [L2]

Mapping of Course Outcomes with Program Outcomes (Pos):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	3	1	3	3	3	3	2
CO2	3	2	1	2	2	3	3	1	3	3	3	2
CO3	3	2	1	3	3	3	2	2	3	3	3	2
CO4	3	3	2	3	1	3	1	3	2	3	3	2
CO5	3	2	2	2	1	3	3	3	3	3	3	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	2	3	2
CO3	3	2	3	2
CO4	3	1	3	2
CO5	3	3	3	2

3/2/1Indicates Strength of Correlation, 3–High,2-Medium,1- Low:

Category	Basic Science	Engineering Science	Humanities and Social Science	Program Core	Program Elective	Open Elective	Inter Disciplinary	Skill Component	Practical / Project			
				✓								

COURSE CODE	COURSE NAME	COMPUTER NETWORKS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBCS22007	Prerequisite: OPERATING SYSTEMS		Ty	3	0/0	0/0	3

Unit I INTRODUCTION **9 Hrs**

Introduction to computer networks and uses – Network: devices, topology, types– Reference model – The physical layer – The theoretical basis for data communication – Transmission media: Guided and unguided- Public Switched Telephone Network. Mobile telephone system.

Unit II DATA LINK LAYER **9 Hrs**

Data link layer design issues – Error detection and correction – Sliding window protocols- example data link protocols HDLC –Channel access on links: SDMA – TDMA – FDMA – CDMA – ETHERNET – 802.11, 802.16 – Bridges and Switches-Bluetooth

Unit III NETWORK LAYER **9 Hrs**

Network layer design issues – Circuit switching – Packet switching – Virtual circuit switching-Routing algorithms – Congestion control algorithms – Internetworking-Network layer in Internet –IPV4 and Basics – IPV6 Addressing – IPV6 Protocol.

Unit IV TRANSPORT LAYER **9 Hrs**

Transport layer design issues – Transport protocols – Simple transport protocol – Internet transport protocols UDP, TCP – Flow Control – Congestion control – Congestion avoidance

Unit V APPLICATION LAYER **9 Hrs**

Domain name system-Electronic mail–Introduction to World Wide Web: HTTP, APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet, RTP.

Total Hrs: 45

Text book:

1. Peterson Davie (2012) Computer Networks-A system Approach (2nd ed.), Morgan Kauffman Har court Publishers.
2. JamesF. Kurose, KeithW. Ross Computer Networking: Atop-DownApproach/Edition6, Pearson publication,2012.

References:

1. *AndrewS. Tanenbaum. DavidJ. Wetherall, "Computer Networks "5th Edition PHI,2011*
2. *William Stallings," Data and computer communications", PHI,2001*
3. *Douglas E. comer," Inter networking with TCP/IP-Volume-I", PHI,5th edition2006*
4. *Godbole, "Data communication and networking", TMH,2004.*
5. *ForouzanB.A., "Data Communications and networking", TMH, 2003.*

Subject Code: EBML24L04	COURSE NAME: GENERATIVE AI LAB	Ty/Lb/ETL	L	T/S. Lr	P/R	C
	Prerequisite: ML&DL	Lb	0	0/0	3/0	1

L: Lecture T: Tutorial S.Lr: Supervised LearningP: ProjectR: ResearchC: Credits
Ty/Lb/ETL: Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To gain hands-on experience with Tensor Flow 2 for basic tensoroperations and neural network implementation.
- To learn preprocessing and cleaning techniques for datasets, including handling missing values, normalizing data, and encoding categorical variables.
- To explore data visualization techniques for analyzing patterns and distributions in data sets used for Generative AI.

COURSE OUTCOMES(COs): (3-5)

CO1	Understand and implement Tensor Flow 2 for basic tensoroperations and neural network models.
CO2	Preprocess and visualize datasets effectively for Generative AI applications using Python libraries like Pandas, NumPy, Matplotlib, and Seaborn.
CO3	Develop and train Generative Adversarial Networks (GANs)andexperimentwith advanced Architectures for image generation tasks.
CO4	Implement and fine-tune models for text and music generation using LSTM andTransformer-based approaches.
CO5	Create practical applications using Generative AI models for generating images, videos, text, and music.

Mapping of Course Outcomes (COs)with Program Outcomes (POs):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	3	3	3	3	3			1		3	
CO2	2	1	3	3		3					3	
CO3	3	3	3	3		3		3	1			
CO4												
CO5												

Mapping of Course Outcomes (COs) with Program Specific Outcomes (PSOs):

COs/PSOs	PSO1	PSO2	PSO3	
CO1	3			
CO2	3			
CO3	3			
CO4			c	
CO5				

3/2/1indicates Strength of Correlation,3-High,2-Medium,1-Low:

Category	BasicSciences	Engineering Sciences	HumanitiesandSocialSciences	ProgramCore	Program Electives	OpenElectives	Practical/ Project	Internships / TechnicalSkill	SoftSkills			
							✓					

SubjectCode:	COURSE NAME:	Ty/Lb/ETL	L	T/S. Lr	P/R	C
EBML24L04	**GENERATIVE AI LAB** **Prerequisite: ML&DL**	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

1. Perform basic operations withTensor Flow 2 tensors using Python.
2. Clean and preprocess datasets for Generative AI, handling missing data, normalizing features, and encoding categorical variables.
3. Use Matplotlib or Seaborn to create histograms, scatterplots, and heatmaps for analyzing data distributions and patterns.
4. Build and traina Generative Ad versarial Network (GAN)on datasets like MNIST or CIFAR-10.
5. Train GANs on custom datasets, optimizing hyper parameter sandloss functions.
6. Explore and implement Wasserstein GANs, Progressive GANs, or Style GANs for generating high-quality images.
7. Develop applications for image and video generation, such as art creation or deep fakes, using trained models.
8. Implement an LSTM network for generating text basedon a given dataset.
9. Fine-tuneaTransformer model(likeGPT) for coherent and contextually relevant text generation.
10. Process and represent music dataf or AI models to generate music, exploring formats like MIDI or audio files.

Total Hours:45

COURSE CODE: EBML24L05	COURSE NAME: ARTIFICIAL INTELLGENCE AND MEACHINE LEARNING TOOLS LAB	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: ML&DL	Lb	0	0/0	3/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to
- To understand the basics of Artificial Intelligence and Machine Learning
- To gain practical experience using AI/ML tools and libraries
- To learn how to prepare and clean data for machine learning
- To implement and test machine learning algorithms
- To evaluate the performance of machine learning models

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the basic concepts of Artificial Intelligence and Machine Learning.
CO2	Use programming tools such as Python, Scikit-learn, TensorFlow, Keras, and Google Colab for AI/ML development.
CO3	Preprocess raw data for machine learning applications using techniques like normalization, encoding, and handling missing values.
CO4	Implement and test supervised machine learning algorithms such as Decision Trees, KNN, SVM, and Logistic Regression.
CO5	Evaluate the performance of machine learning models using metrics like accuracy, precision, recall, F1-score, and confusion matrix.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/Pos	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	2	3	1	2	1	1	2	3	2	2	
CO2	2	3	1	2	3	3	2	1	2	2	1	
CO3	3	2	2	1	2	2	2	2	2	3	1	
CO4	3	3	1	2	3	2	1	3	3	2	1	
CO5	1	2	2	2	1	2	2	1	2	3	2	

COs / PSOs	PSO1	PSO2	PSO3	
CO1	3	2	3	
CO2	3	3	3	
CO3	2	3	2	
CO4	1	2	1	
CO5	2	1	3	

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
									✓			

Subject Code:	COURSE NAME:	Ty/Lb/ETL	L	T/S. Lr	P/R	C
EBML24L05	**ARTIFICIAL INTELLGENCE AND MEACHINE LEARNING TOOLS LAB** **Prerequisite:ML&DL**	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

1. Generate a Python function that solves a complex problem (e.g., a sorting algorithm with time complexity analysis). Compare its accuracy and optimization.

2. Create an interactive quiz-based presentation using Slidequest, and assess how the tool handles interactive content and user engagement.
3.. Test both MidJourney ability to generate highly imaginative, surreal landscapes based on a detailed prompt.

4. Create a Social Media Post for a New Product Launch USING Canva TOOLS.
5.Create an AI-Generated Logo for a Startup healthcare using Magic Studios
6.Implement the neural networks for regression using tensorflow
7. Implementation of Python library for ML applications such as Pandas, Matclotlib.
8. To recognize how an image is formed and manipulate using Image Formation techniques.
9. To Extract features from the image using keypoint detection methods.
10. To utilize a Convolutional Neural Network pre-trained deep learning model to classify objects within an image.

Total Hours:45

Tools Used:

1. Canva TOOLS.

2.Pandas, Matclotlib., Tensorflow.
Language
Python.

References:

1. Tom Taulli, “Generative AI: How ChatGPT and other AI Tools will revolutionize Business Apress,2023.
2. Aurelien Gereon, “Hands on Machine Learning with scikit- Learn, Keras and Tensorflow: concept tools and techniques to Build Intelligent System,’Third Edition by shaolf/o’reilly, 2022.

COURSE CODE: EBCC22I07	COURSE NAME: SOFT SKILL – II (QUALITATIVE AND QUANTITATIVE SKILLS)	Ty/Lb/ ETL/I E	L	T/S. Lr	P/R	C
	Prerequisite: Nil	IE	0	0/0	2/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

The students should be made to

- To bring behavioural patterns of students.
- To train them for corporate culture.
- To create self-awareness.
- To build confidence.
- To train the students for facing the interviews and develop interpersonal relationship.

COURSE OUTCOMES (COs): Students will be able to

CO1	Recognize and apply arithmetic knowledge in a variety of contexts.
CO2	Ability to identify and critically evaluate philosophical arguments and defend them from criticism.
CO3	Define data and interpret information from graphs.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	1	1	3	2	3	3
CO2	2	2	2	3	1	3	1	3	3	3	3	1
CO3	3	3	3	3	3	3	2	2	3	3	3	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	1
CO2	1	2	1	1
CO3	1	1	2	1

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
								✓				

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCC22I07	SOFT SKILLS II (QUALITATIVE AND QUANTITATIVE SKILLS)	IE	0	0/0	2/0	1

(Common to all E&T courses)

UNIT-I: Logical Reasoning I

Logical Statements – Arguments – Assumptions – Courses of Action.

UNIT-II: Logical Reasoning II

Logical conclusions – Deriving conclusions from passages – Theme detection.

UNIT-III: Arithmetical Reasoning I

Number system – H.C.F & L.C.M – Problem on ages – Percentage – Profit & Loss – Ratio & Proportion – Partnership.

UNIT-IV: Arithmetical Reasoning II

Time & Work – Time & Distance – Clocks – Permutations & Combinations – Heights & Distances – Odd man out and Series.

UNIT-V: Data Interpretation

Tabulation – Bar graphs – Pie graphs – Line graphs.

Total Hours:30

Reference Book:

1. R.S. Agarwal, A modern approach to Logical Reasoning, S. Chand& Co., (2017).
2. R.S. Agarwal, A modern approach to Verbal and Non-verbal Reasoning, S. Chand& Co., (2017).
3. R.S. Agarwal, Quantitative Aptitude for Competitive Examinations, S. Chand& Co., (2017).
4. A.K. Gupta, Logical and Analytical Reasoning, Ramesh Publishing House, (2014).
5. B.S. Sijwali, Indusijwali, A new approach to Reasoning (Verbal and Non verbal), Arihant Publishers, (2014).

COURSE CODE: EBML24I03	COURSE NAME: TECHNICAL SKILL III	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Nil	IE	0	0/0	2/0	1

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the domain specific knowledge.
CO2	Able to apply idealistic, practical and moral values.
CO3	Familiarize with emerging technology

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	2	2	1	1	1	3	1
CO2	3	3	2	3	3	2	2	2	2	2	3	1
CO3	3	3	3	3	3	2	2	1	2	2	3	1

COs /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1
CO2	3	3	1	3
CO3	3	3	1	3

3/2/1indicates Strength of Correlation, 3- High, 2- Medium, 1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
								✓	

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24I03	TECHNICAL SKILL III	IE	0	0/0	2/0	1

OBJECTIVES:

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology.

From the list of skill development courses declared by the department, the students are expected to acquire the skill and get certified. This will be evaluated at the end of the semester by the faculty.

DESCRIPTION:

Students should acquire skill in the domain/inter disciplinary area from government/private training centers/industries /University for a minimum period of 15 calendar days. The training can be through off line, online or mixed mode. Students are supposed to prepare technical skill report at the end of the training and submit the report along with the certificate in proof of the training, during the viva voce examination conducted by the examiners duly appointed by the head of the department.

Total Hours:30

COURSE CODE: EBML24I04	COURSE NAME: MINI PROJECT /INTERNSHIP	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: NIL	**IE**	**0**	**0/0**	**3/0**	**1**

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

The students should be made to

- The main objective of the Inplant training is to provide a short-term work experience in an Industry/ Company/ Organization

COURSE OUTCOMES (COs): Students will be able to	
CO1	Aspire an insight of an industry / organization/company pertaining to the domain of study.
CO2	Construct skills and knowledge for a smooth transition into the career.
CO3	Support field experience and get linked with the professional network.
CO4	To equip the students with industry knowledge and understanding of various possible technologies.
CO5	To impart the knowledge of various technologies, form the industry resources

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	3	3	3	3	3	3	3
CO2	3	2	3	3	2	3	3	3	3	3	3	2
CO3	3	3	3	3	2	3	3	3	3	3	3	2
CO4	2	1	3	1	3	3	2	2	2	2	2	2
CO5	1	2	3	2	3	2	3	2	2	2	1	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	3
CO2	3	2	3	3
CO3	3	3	3	3
CO4	2	3	2	3
CO5	3	2	3	2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
									✓			

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24I04	MINI PROJECT /INTERNSHIP	IE	0	0/0	3/0	1

OBJECTIVES:

- The main objective of the In-plant training is to provide a short-term work experience in an Industry/ Company/ Organization

DESCRIPTION:

- MINI PROJECT:

Students will have an opportunity to expose their knowledge and talent to make an innovative project. Students are supposed to do innovative projects useful to industries/society in the area of relevant Engineering, inter and multi-disciplinary areas, under the guidance of a staff member. They have to prepare a project report and submit to the department.
At the end of the semester Viva-Voce examination will be conducted by the internal Examiner duly appointed by the Head of the department and the students will be evaluated.

- INTERNSHIP:

Students are supposed to undergo internship in related Industries for a minimum period of 30 days cumulatively during the semester. They have to prepare a report on the Internship with a certificate in proof from competent authority in the industry. At the end of the semester Viva-Voce examination will be conducted by the Examiners duly appointed by the Head of the department and the students will be evaluated.

Total Hours:45

VII SEMESTER

COURSE CODE	COURSE NAME: BIG DATA FRAMEWORK	Ty/Lb/ ETL /IE	L	T/SLr	P/R	C
EBML24006	**Prerequisite: DBMS**	TY	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE/IE: Theory/Lab/EmbeddedTheoryandLab/InternalEvaluation

OBJECTIVES:
The students should be made:

- To understand the need for frameworks to store and process big data.
- To gain knowledge of Big Data technologies for processing various types of data.
- To comprehend advanced frameworks for faster access and processing of Big Data.
- To integrate a wide range of data processing and analysis tools.

COURSE OUTCOMES(Cos): Upon completion of this course, students should be able to:

CO1	Understand the need for new frameworks to handle large amounts of data.
CO2	Demonstrate the Hadoop framework, including HDFS and MapReduce.
CO3	Demonstrate the Pig architecture and evaluate Pig scripts.
CO4	Describe the Hive architecture and execute Hive queries on sample datasets.
CO5	Demonstrate Spark programming with different programming languages and graph algorithms, and execute Impala scripts.

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2							
CO2	3	3	3	3	3				2			
CO3	3	3	3	3	3							
CO4	3	3	3	3	3							
CO5	3	3	3	3	3	3			2			

Cos/Pos	PSO1	PSO2	PSO3		
CO1	1	1	1		
CO2	3	2	2		
CO3	3	2	2		
CO4	3	2	2		
CO5	3	2	2		

3/2/1 Indicates Strength of Correlation, 3–High,2-Medium,1- Low:

Category	BasicScience	EngineeringScience	Humanities andsocialScience	ProgramCore	Programe lective	OpenElective	InterDisciplinary	SkillComponent	Practical /Project
				√					

COURSE CODE	COURSE NAME: BIG DATA FRAMEWORK	Ty/Lb/ETL/IE	L	T/SLr	P/R	C
EBML24006	**Prerequisite: DBMS**	TY	3	0/0	0/0	3

Unit I: Big Data **9 hours**

Understanding Big Data: Concepts and terminology, Big Data characteristics, different types of data, identifying data characteristics - Need for Big Data frameworks - Big Data Architecture - Big Data Storage: File systems and Distributed File Systems, NoSQL Databases, Sharding, Replication.

Unit II: Hadoop Framework **9 hours**

Hadoop Architecture - Hadoop Distributed File System (HDFS) - YARN - Hadoop I/O - MapReduce: Developing a MapReduce application, working procedure, types and formats, features of MapReduce, sorting and joins, pipelining MapReduce jobs.

Unit III: Hadoop Technologies - PIG **9 hours**

Introduction - Parallel processing using PIG - PIG Architecture – Grunt - PIG Data Model: Scalar and complex types - PIG Latin: Input and output, relational operators, user-defined functions - Working with scripts - Hadoop operations.

Unit IV: Hive and Spark **9 hours**

Introduction to Hive modules - Data types and file formats - HiveQL: Data definition and data manipulation, queries, views, reducing query complexity, scripts, indexes, aggregate functions - Overview of Spark - Cluster design and management - Performance considerations - Application Programming Interface (API): Spark Context, Resilient Distributed Datasets (RDDs), creating RDDs, RDD operations, saving RDDs, lazy operations, Spark jobs - Spark programming in Scala, Python, R, Java.

Unit V: Impala **9 hours**

Introduction to Cloudera Impala - Architecture of Impala - Components: Impala Daemon, Impala Statestore, Impala Catalog Service - Query processing interfaces - Impala Shell command reference - Impala data types - Creating and deleting databases and tables - Inserting and overwriting table data - Record fetching and ordering - Grouping records - Working with Impala and Hive.

Total Hours:45

Textbooks:

1. Thomas Erl, Wajid Khattak, and Paul Buhler, *Big Data Fundamentals: Concepts, Drivers & Techniques*, Pearson India Education Service Pvt. Ltd., 2022.
2. Tom White, *Hadoop: The Definitive Guide*, O'Reilly Media, Inc., Fourth Edition, 2021.

References:

1. Alan Gates, *Programming Pig: Dataflow Scripting with Hadoop*, O'Reilly Media, Inc., 2011.
2. Jason Rutherglen, Dean Wampler, Edward Capriolo, *Programming Hive*, O'Reilly Media, Inc.
3. Mike Frampton, *Mastering Apache Spark*, Packt Publishing, 2015.
4. John Russell, *Getting Started with Impala*, O'Reilly Media, Inc., September 2014.

Web References:

1. Big Data Framework: An Overview
2. The Most Popular Big Data Frameworks
3. Java Big Data Frameworks

Subject Code: EBML24007	LARGE LANGUAGE MODELS	Ty/ Lb/ ETL	L	T/ S. Lr	P/R	C
	Prerequisite: Machine Learning	Ty	3	0/0	0/0	3

L: LectureT: Tutorial S. Lr: Supervised LearningP: Project R: Research C: Credits
Ty/Lb/ETL: Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- The students will have knowledge about process and understanding of NLP
- To understand to translate the languages.
- To learn answer to question of text.
- To study about the processing tasks with high accuracy.
- To study about human like communication by models.

COURSE OUTCOMES(COs):(3-5)

CO1	Learn the concept to f Machine Learning
CO2	Recognize the importance of Deep Learning.
CO3	Understand the transform er model.
CO4	Learn the Large language Models.
CO5	Understand about Pretrained Models.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	
CO1	2	1	2	1	3	3	3	2	3	2	2	
CO2	3	3	3	2	3	3	3	3	3	2	3	
CO3	3	3	2	3	3	2	2	3	2	3	2	
CO4	2	3	2	3	3	2	3	2	2	2	2	
CO5	3	3	2	2	3	3	2	3	2	3	3	

COs/ PSOs	PSO1	PSO2	PSO3	
CO1	2	2	2	
CO2	3	3	2	
CO3	3	3	3	
CO4	3	2	2	
CO5	3	3	2	

3/2/1indicates strength of correlation, 3–High,2 –Medium,1–Low:

Category	Basic Sciences	EngineeringSciences	HumanitiesandSocialSciences	Program Core	Program Electives	Open Electives	Practical/Project	Internships/Technic	SoftSkills			
				✓								

Subject Code: EBML24007	Large Language Models	Ty/ Lb/ ETL	L	T/ S. Lr	P/R	C
	Prerequisite: Machine Learning	Ty	3	0/0	0/0	3

UNIT-I: LLMs Introduction. **9 Hrs.**

Natural Language, NLP and Language Models Evolution, Syntactic and Grammar-based methods, Statistical Models: Neural Models and Dense Representations: LLM Evolution. Encoder-Decoder Architecture. Training and Optimization. Attention Mechanism. Self-Attention. Transformers Tokenization, Positional Encodings. Multi-Head Attention. Position-Wise Feed-Forward Neural Networks. Pre-trainedLLMDesign, Methods.Architectures, Pre-trainedLLMs.BERTT5GPT.

UNIT-II: Prompt Based Learning and Adaptation. **9 Hrs**

Prompt-based Learning.Fully Supervised Learning. Pre-train and Fine-tune Learning.Prompt-based Learning.Basics of Prompt-based Learning.Prompt-based Learning: Formal Description. Prompt-based Learning Process. Prompt-based Knowledge Extraction. Prompt Engineering. Template Design Continuous Search. LLM Adaptation and Utilization, Tuning. Instruction Tuning Data. Instruction Tuning for Domain Adaptation. Parameter-Efcient Fine-Tuning. Adapters.Reparameterization.

UNIT-III: Tuning LLMs. **9 Hrs.**

Tuning for LLM Alignment. Alignment Tuning. Honesty. Harmlessness. The Reinforcement Learning Framework.Safety, Quality, and Groundedness in LLMs.Deep Reinforcement Learning, LLMs Helpful, Honest, and Harmless. LLM Challenges and Solutions.Evaluation Metrics.

UNIT-IV: Retrival–Augmented Generation–RAG. **9 Hrs**

Retrieval-Augmented Generation. Basics of RAG. Optimizing RAG.EnhancingRAG. Data Sources and Embeddings. LLMs in Production. LLM Applications Conversational AI, chatbots and AI assistantsContentCreation.Search, Information Retrieval, and Recommendation Systems Categories of LLMs. LLME valuation Metrics. Perplexity. BLEU. ROUGE. BERTScore. LLM Selection Vector Databases. Prompt Engineering. LLMOps.

UNIT-V: Multi modal LLMs. **9 Hrs.**

Multimodal LLMs. Multimodal LLM Framework. Modality Encoder.InputProjectorPre-training: Core LLMs, Datasets and Task-Specifc MMLLM Tuning and Enhancements.State-of-the-Art MMLLMs.9.5.1Flamingo (Image-Video-Text). Video-LLaMA (Image-Video-Audio-Text). NExT-GPT (Any-to-Any), LLMs: Evolution and New Frontiers. **Total Hrs: 45**

Text Book:1. Large Language Models: A Deep Drive Bridging Theory and Practice, Springer2024.

Reference Book:

1.IntroductiontoLargeLanguageModelsGenerativeAIforText.TonmoyChakravarthy, Weiley.

COURSE CODE	COURSE NAME	Data Exploration and Data Visualization	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24008	Prerequisite: Statistics & Probability		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to:
Understand the Principles of DataVisualization
Learn Various Data Visualization Techniques
Apply Best Practices in Visual Design
Develop Skills in Data Exploration and Analysis
Create and evaluate Effective Data Stories and Dashboards

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand how human perception influences data interpretation
CO2	Choose the right chart types for different data types and analytical goals
CO3	Incorporate story telling techniques to make data insights more compelling
CO4	Understand and visualize uncertainty, confidence intervals and variability in data
CO5	Design data-driven reports for business intelligence and decision-making

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	2	1	1	1	2	1	2
CO2	3	3	3	2	3	1	1	1	2	1	2
CO3	2	2	3	2	2	1	1	2	3	2	2
CO4	3	3	2	3	3	1	1	1	2	1	2
CO5	3	3	3	3	3	2	1	2	3	3	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	1	2
CO2	3	2	3
CO3	2	2	3
CO4	3	3	3
CO5	3	3	3

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	HumanitiesandsocialScience	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
				√					

COURSE CODE	COURSE NAME	Data Exploration and Data Visualization	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24008	Prerequisite: Statistics& Probability		Ty	3	0/0	0/0	3

Unit I Introduction **9 Hrs**

The Importance of Data Visualization-The Data Visualization Process-Types of Data Visualizations-Common Data Visualization Tools-Selecting a Chart Type - Understanding Data Types-Choosing the Appropriate Chart-Avoiding Misleading Visualizations-Case Studies in Chart Selection

Unit II Data Visualization and Design **9 Hrs**

Principles of Good Design-Layout and Composition-Typography in Data Visualization-Enhancing Readability and Aesthetics-Purposeful Use of Color-Color Theory Basics-Choosing Effective Color Palettes-Color Blindness Considerations-Using Color to Highlight Data

Unit III Visualizing Variability **9 Hrs**

Understanding Variability in Data-Types of Variability- Measures of Variability- Techniques to Display Variability-Interpreting Variability Visualizations-Applications in Different Fields

Unit IV Exploring Data Visually **9 Hrs**

Techniques for Data Exploration-Interactive Visualizations-Identifying Patterns and Outliers-Tools for Visual Data Exploration-Explaining Visually to Influence with Data- Crafting a Data-Driven Narrative-Designing for Your Audience-Storytelling with Data- Case Studies in Persuasive Visualizations

Unit V Data Dashboards **9 Hrs**

Principles of Dashboard Design-Selecting Key Performance Indicators (KPIs)- Interactive Elements in Dashboards-Best Practices and Common Pitfalls -Telling the Truth with Data Visualization-Ethical Considerations in Data Visualization-Avoiding Deceptive Practices-Ensuring Data Integrity-Building Trust through Transparency

Total Hours : 45

Text book:

1. Data Visualization: Exploring and Explaining with Data, Jeffrey D. Camm, James J. Cochran, Michael J. Fry, and Jeffrey W. Ohlmann, Cengage Learning, 2022

References:

1. Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures, Claus O. Wilke, O'Reilly Media ,2019

COURSE CODE	COURSE NAME	User Inerface and Experience Design	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24009	**Prerequisite: Human Computer Interaction, Computer Graphics, Web Design**		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To apply the knowledge of user- centered design, user -centered methods in design, graphic design on screens simulation.

• The prototyping techniques, usability testing methods, interface technologies and user centered design in corporate perspective.

COURSE OUTCOMES (Cos): Students will be able to

CO1	To Understand the principle of UI & UX.
CO2	Associate the Core Concept of Information Architecture.
CO3	To Apply Fundamental UI Design Principles
CO4	Creating a wireframing and Prototype.
CO5	Analyze the Research and Case Studies to Extract Design Insights

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	1	1	2	-	1	-	1	-	-
CO2	2	1	2	1	2	-	2	-	-	1	1
CO3	2	2	3	3	3	2	3	-	-	1	-
CO4	2	3	3	3	3	-	3	-	-	2	1
CO5	3	3	3	3	3	2	3	-	3	1	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	1	1	-
CO2	1	1	-
CO3	3	-	3
CO4	3	1	3
CO5	3	3	3

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical / Project
				√					

COURSE CODE	COURSE NAME	User Inerface and Experience Design	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24009	Prerequisite: Human Computer Interaction, Computer Graphics, Web Design		Ty	3	0	0	3

Unit I Introduction to UI/UX Design **9 Hrs**

Understanding UI and UX - User Centric design Principles - Design thinking Process - Design tools and software - Conducting user interview and Surveys.

Unit II User Information Architecture **9 Hrs**

Information Architecture and wire Framing - Prototyping and mockup creation - Structure - Simple Business - Heavy product and services - Marketing - Driven versus Revenue.

Unit III UI Design Foundations **9 Hrs**

Visual and UI Principle - UI Element and Patterns - Typography and color theory - Branding - Market place - Style Guides.

Unit IV Wireframing, Prototyping and Testing **9 Hrs**

Sketching Principles - Responsive Design - Wireframing - Creating Wireflows - Buliding Prototype - Building High - Fidelity Mockups - Interaction Patterns - Prototype Iteration.

Unit V Research & Case Study **9 Hrs**

Identifying and writing Problem statement - Identifying Appropriate Research Methods - creating personas - B2B Software Saas, Paas - Machine Learning - AI - Data Products - Design System and Component Libraries.

Total Hours : 45

Text book:

1. Joel Marsh, "UX for Beginners", O'Reilly, 2023

References:

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" 3rd Edition, O'Reilly 2020

2. Luke Welling, Laura Thomson "PHP and MySQL Web Development" Person Education 5 Edition – 2016.

3."Don't Make Me Think" by Steve Krug, Publisher: New Riders; 3rd edition'2014

COURSE CODE	COURSE NAME: BIG DATA FRAME WORK LAB	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24L06	Prerequisite: Java or Python Programming Lab	Lb	0	0/0	3/0	1

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

1. Design and develop skills in analyzing and processing large datasets.
2. Impart the skills required to create a big data ecosystem.
3. Analyze and design applications for bigdata processing and analytics.
4. Use different techniques to design and implement bigdata solutions.
5. Develop effective prototypes to evaluate and validate bigdata solutions.

COURSE OUTCOMES(Cos):
Upon completion of this course, students should be able to:

CO1	Understand the need for new frame works to handle large amounts of data.
CO2	Demonstrate the Hadoop frame work, including HDFS and Map Reduce.
CO3	Demonstrate the Pig architecture and evaluate Pigscripts.
CO4	Describe the Hivearchitecture and execute Hivequeries on sample datasets.
CO5	Demonstrate Spark programming with different programming languages and graph algorithms, and execute Impala scripts.

Mapping of Course Outcome with Program Outcome (POs):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	3	3	1	1	3	3	1
CO2	2	3	2	2	3	1	3	1	3	3	2
CO3	3	2	3	2	3	2	3	1	3	3	1
CO4	2	2	3	2	3	2	2	1	3	3	1
CO5	2	2	2	1	3	2	2	2	3	3	1

COs/POs	PSO1	PSO2	PSO3		
CO1	3	2	2		
CO2	2	3	2		
CO3	3	2	3		
CO4	2	2	3		
CO5	2	2	2		

COs/Pos

Category	Basic Science	Engineering Science	Humanitiesand social Science	ProgramCore	Program	OpenElective	Inter Disciplinary	Skill Component	Practical /Project
									√

COURSE CODE	COURSE NAME	Ty/ Lb/ ETL	L	T/ S. Lr	P/R	C
EBML24L06	**BIG DATA FRAME WORK LAB** **Prerequisite: Java or Python Programming Lab**	Lb	0	0/0	3/0	1

Experiments:

1. Hadoop Installation and Configuration
2. Hadoop File Management
3. Matrix Multiplication with Hadoop Map Reduce
4. Integrating Impala with HDFS
5. Advanced Hadoop File Management
6. Large-Scale Matrix Multiplication with Hadoop
7. Data Ingestion into Hadoop for Impala
8. Integrating Impala with Other Big Data Tools
9. Spark Programming
10. Data Visualization with Hive and Tableau

Total:45 Hrs

COURSECODE: EBML24L07	DATA VISUALIZATION LAB	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Visual Layouts and Graphical Properties	Lb	0	0/0	3/0	1

L: LectureT: Tutorial S.Lr: SupervisedLearningP: ProjectR: ResearchC: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theoryand Lab/InternalEvaluation

OBJECTIVE:

The students should be made to

- Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
- To discern patterns and relationships in the data.
- To build Dashboard applications.
- To communicate the results clearly and concisely.
- To be able to work with different formats of data sets.

COURSE OUTCOMES (COs): Students willbeableto

CO1	Understand how to import data into Tableau. (L1)
CO2	Understand Tableau concepts of Dimensions and Measures. (L2)
CO3	Develop programs and understand how to map Visual Layouts and Graphical Properties(L3)
CO4	Create a Dashboard that links multiple visualizations(L4)
CO5	Use graphical user interfaces to create Frames for providing solutions to real-world problems (L5)

Mapping of Course Outcomes with Program Outcomes (POs):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	-	2	-	-	-	3	2	-
CO2	3	3	3	-	3	2	-	-	3	-	-
CO3	3	3	3	3	3	3	2	2	3	-	-
CO4	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	-
CO2	3	3	2
CO3	3	3	3
CO4	3	2	3
CO5	3	3	3

3/2/1Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	EngineeringScience	HumanitiesandsocialScience	ProgramCore	Program elective	Open Elective	InterDisciplinary	SkillComponent	Practical/Project	
									✓	

COURSECODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/S. Lr	P/R	C
EBML24L07	DATA VISUALIZATION LAB	Lb	0	0/0	3/0	1

LIST OF EXPERMENTS:

1 . Getting Started - Tableau Workspace, Tableau terminologies, basic functionalities.

2 . Connecting to Data Source – Connecting to Database, Different types of Tableau Joins.

3.Creating a View - Formatting charts, adding filters, creating calculated fields and defining parameters.

4.Dashboard Design and Storytelling – Components of Dashboard, understanding how to place worksheets in Containers, Action filters and its types.

5.Introducing Power BI – Components and the flow of work. Power BI Desktop Interface - The Report has five main areas.

6.Querying Data from CSV - Query Editor, Connecting the data from the Excel Source, Clean, Transform the data.

7.Creating Reports & Visualizations - Different types of charts, Formatting charts with Title, Colors.

8 . Dashboards - Filters in Power BI, Formatting dashboards.

9. Sales Revenue Analysis:

1. **Choropleth Map:** Highlight states with the highest revenue.
2. **Line Chart:** Revenue trends by month.
3. **Histogram:** Bin age into 10 categories for revenue analysis.
4. **Donut Chart:** Revenue percentage by region.
5. **Butterfly Chart:** Compare revenue by gender & product category.
6. **Calculated Field:** Categorize profitable/non-profitable states.
7. **Dashboard:** Revenue visualization.

10. GDP Analysis:

1. **Symbol Map:** GDP by country (lat-long).
2. **Bar Chart:** GDP of Belgium (2006–2026).
3. **Bar Chart:** GDP of selected countries (2010).
4. **Comparison:** GDP trends of Bhutan & Costa Rica.
5. **Scatter Plot:** GDP comparison of Mexico, Algeria, Fiji & Estonia.
6. **Dashboard:** Interactive GDP analysis.

11. HR Data Analysis:

1. **KPIs:** Employee count, attrition rate, active employees, avg age.
2. **Lollipop Chart:** Attrition rate by gender/category.
3. **Pie Chart:** Attrition % by department.
4. **Bar Chart:** Employees by age group.
5. **Highlight Table:** Job Satisfaction by role & count.
6. **Horizontal Bar Chart:** Attrition by education field.
7. **Donut Charts:** Attrition rate by gender & age group.

12. Amazon Prime Data Analysis:

1. **Donut Chart:** % of movies vs. TV shows.
2. **Area Chart:** Releases by year & type.
3. **Bar Chart:** Top 10 genres.
4. **Map:** Shows by country.
5. **Text Sheet:** Movie descriptions.
6. **Dashboard:** Interactive content analysis.

REFERENCE BOOKS:

1. Data visualization with python: create an impact with meaningful data insightsusinginteractive and engaging visuals, Mario Dobler, TimGrobmann, Packt Publications,2019
2. Practical Tableau:100Tips, Tutorials, and Strategies from a Tableau ZenMaster, Ryan Sleeper, Oreilly Publications, 2018
3. DataVisualizationwithR:111Examples by ThomasRahlf, Springer,2020

Total Hours:45

COURSE CODE: EBML24I05	COURSE NAME: PROJECT PHASE - I	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: NIL	IE	0	0/0	3/3	2

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL /IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

The students should be made to

- The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue, address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

COURSE OUTCOMES (COs): Student**s** will be able to

CO1	Apply the knowledge and skills acquired in the course of study, addressing a specific problem or issue.
CO2	Design the software system effectively
CO3	Encourage students to think critically and creatively about societal issues and develop user friendly solution.
CO4	Support the field experience and get linked with the professional network.
CO5	Equip the students with industry knowledge and understanding of various possible technologies.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	3	2	3	2	3	2	2	3	2	3	
CO2	3	3	3	3	3	3	3	2	2	2	3	
CO3	3	3	3	3	3	3	3	2	2	3	3	
CO4	3	2	3	3	3	3	2	3	3	3	3	
CO5	2	2	2	2	2	2	3	2	2	2	1	

COs / PSOs	PSO1	PSO2	PSO3	
CO1	3	2	3	
CO2	3	3	3	
CO3	3	3	3	
CO4	2	2	2	
CO5	3	2	3	

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
									✓			

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24I05	PROJECT PHASE – I	IE	0	0/0	3/3	2

OBJECTIVE:

B. Tech CSE Project carries 12 credits of which, Phase I carries 2 credits.

In Phase I, Students are expected to

i. Identify a Problem.

ii. Have the feasibility explored.

iii. Freeze the Requirement specification (both user and system).

iv. Construct the architectural model (as many as required).

v. Design the solution.

vi. If possible, publish the Feasibilty study as a survey paper

DESCRIPTION:

Students are expected to do the Project in a group of 3 to 4 students. They should identify the area/topic of the Project and should collect the literatures related to the project. Students intending to do Industrial projects will approach the industries with the support of the university, identify the industrial problem and finalize the project. In case of Industrial projects apart from Industry guide, a guide has to be appointed by the department. At the end of the Semester the students should submit their Project Phase - I report to the Department and Viva -Voce examination will be conducted by the examiners duly appointed by the Head of the department.

Total Hours:45

VIII SEMESTER

COURSE CODE	COURSE NAME	TOTAL QUALITY MANAGEMENT	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBME22E24	Prerequisite: NIL		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The student will learn
Various Principles and Tools of TQM; ISO Standards

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand the various quality tools and techniques
CO2	Demonstrate the customer satisfaction techniques
CO3	Exposed to quality auditing system and procedures
CO4	Implement TQM and TPM
CO5	Implement Kaizen and conduct FMEA

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	2	2	2	3	3	3	2	2
CO2	3	1	2	2	2	2	2	3	3	3	3	3
CO3	3	1	2	2	2	2	3	3	3	3	2	3
CO4	3	1	2	2	2	2	3	3	3	3	3	2
CO5	3	2	2	2	2	2	3	3	3	3	3	3

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3
CO2	3	3	2	3
CO3	3	3	2	3
CO4	3	3	2	3
CO5	3	3	2	3

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanities and Social Science	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
							√		

COURSE CODE	COURSE NAME	TOTAL QUALITY MANAGEMENT	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBME22E24	Prerequisite: NIL		Ty	3	0/0	0/0	3

UNIT- I: INTRODUCTION **9 Hrs**

Definition of Quality, Dimensions, Planning of quality, conformance to specification, Quality costs-. Basic concepts and evolution of Total Quality Management, Principles of TQM, Deming Philosophy Deming prize MBNQA. Barriers to TQM Implementation.

UNIT- II: TQM PRINCIPLES **9 Hrs**

Customer satisfaction-Customer Perception of Quality, Customer Complaints. Service Quality, Customer Retention. Employee Involvement- Motivation, Empowerment, Teams. Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement-Juran Triology, PDSA Cycle,58,Kaizen.Supplier Partnership- Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures-Basic Concepts. Strategy, Performance Measure.

UNIT- III: STATISTICAL QUALITY CONTROL **9 Hrs**

The Seven Tools Of Quality, Statistical Fundamentals, Control Charts For Variables And Attributes, Process Capability, Concept Of Six Sigma, Phases And Defective UNIT-s Of Six Sigma .Overview Of GB,BB,MBB Leadership Characteristics ,Leadership Concept , Role Of Senior Management, Lean Management Principle, Strategic Planning New Seven Management Tools.

UNIT- IV: TQM TOOLS **9 Hrs**

Benchmarking-Reasons to Benchmark, Benchmarking Process. Quality Function Deployment (QFD), pareto, process flow diagram, check sheets and histogram Taguchi Quality Loss Function. Total Productive Maintenance (TPM)-Concept, Improvement Needs, FMEA-Stages of FMEA.

UNIT- V: QUALITY SYSTEMS **9 Hrs**

Need For ISO 09000 and Other Quality Systems, ISO 09000 – 2000 Quality System -Elements. Implementation Of Quality System, Documentation , Quality Auditing, Quality Council, Quality statements ,Quality Management System TS 1609409, ISO 14000 Concept, Requirements And Benefits. Introduction To Capability Material Management (CMM), People Capability Management (PCM).

Total Hours : 45

Textbook:

1. "Total Quality Management: Key Concepts and CaseStudies"D.R. Kiran, Elsevier,2023
2. "EssentialsofTotalQualityManagement", M.S. Phadke, PHI Learning, 2022

References:

1. "SixSigma: Concepts, Tools, andApplications", S.K. Gupta&J.D. Sharma, WileyIndia Pvt Ltd,2021
2. 2. "ISO9001:2015for Quality Systems: APracticalGuide", ChadKymal, ASQQualityPress,2022
3.

COURSE CODE: EBML24L08	COURSE NAME: PROJECT PHASE – II	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Project Phase I	Lb	0	0/0	16/16	8

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL /IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

The students should be made to

- The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue, address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

COURSE OUTCOMES (COs): Students will be able to

CO1	To explain the functionality of the system
CO2	To express proficiency in handling the technologies
CO3	To support the societal problems
CO4	To summarize the innovative ideas with good documentation
CO5	To validate the implementation of the software/Hardware system

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	3	1	2	2	3	3
CO2	3	3	3	3	3	3	3	2	2	2	3	3
CO3	3	3	3	3	3	3	3	2	2	3	3	3
CO4	3	2	3	3	3	3	2	3	3	3	3	3
CO5	1	2	2	2	2	2	3	2	2	2	1	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	2	2	2	2
CO5	3	2	2	2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
									✓			

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24L08	PROJECT PHASE – II	Lb	0	0/0	16/16	8

OBJECTIVE:

Students are expected to carry out the following:

(i) Implement the Design using suitable technologies.

(ii) Generate the test cases.

(iii) Demonstrate the solution with suitable user interface.

(iv) Prepare a project report consolidating the phase-I and II activities.

DESCRIPTION:

To make the students to make use of the knowledge and skill developed during their four years of study and to apply them for making an innovative product/process for the development of society and industries.

Students are expected to do a Project work either in an Industry or at the University in the field of relevant Engineering /inter-disciplinary /multi-disciplinary area in a group of 3 or 4 students. The work to be carried out in Phase II should be continuation of Phase I. Each group will be allotted a guide based on the area of Project work. In case of industrial Project external guide has to be allotted from Industry. Inter disciplinary/multi-disciplinary project can be done with students of different disciplines as a group. Monthly reviews will be conducted during the semester to monitor the progress of the project by the project review committee. Students have to submit the Project thesis at the end of the semester and appear for the Project Viva-Voce examination conducted by the examiners duly appointed by the Controller of Examination. In case of industrial project certificate in proof has to be included in the report along with the bonofide certificate.

PROGRAM ELECTIVE – I
SYLLABUS

COURSE CODE	COURSE NAME	SOFTWARE TESTING AND AUTOMATION	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E01	Prerequisite:		TY	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

ensure the quality, reliability, and performance of software applications while optimizing efficiency and reducing costs. By identifying and fixing defects early, testing helps prevent issues from reaching production, improving overall software stability. Automation accelerates test execution, reduces manual effort, and increases accuracy, ensuring consistent and repeatable results. It also enhances test coverage by validating complex scenarios across multiple platforms and environments. Integrating automated testing intoCI/CD pipelines supports Agile and DevOps methodologies, enabling rapidand
confident releases.

COURSE OUTCOMES(Cos): Students will be able to

CO1	To understand the basics of software testing
CO2	To learn how to do the testing and planning effectively
CO3	To build test cases and execute them
CO4	To focus on wide aspects of testing and understanding multiple facets of testing
CO5	To get an insight a bouttest automation and the tools used for test automation

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	1	2	1	2	-	-	-	2	1	2	
CO2	3	2	3	3	3	2	1	2	-	1	-	
CO3	3	2	3	2	2	1	-	2	-	-	2	
CO4	3	3	2	2	3	2	2	2	2	2	2	
CO5	3	3	3	2	2	1	-	1	1	2	-	

COs/PSOs	PSO1	PSO2	PSO3	
CO1	3	2	2	
CO2	3	2	3	
CO3	2	2	2	
CO4	3	3	2	
CO5	2	2	2	

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	HumanitiesandsocialScience	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	SOFTWARE TESTING AND AUTOMATION	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E01	Prerequisite:		TY	3	0/0	0/0	3

Unit I FOUNDATIONS OF SOFTWARE TESTING 9 Hrs

Why do we test Software? Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V- model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errorsand Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing

Unit II TEST PLANNING 9 Hrs

Boundary Value Testing, Robust Boundary Value Testing, Worst case Boundary, Special Value Testing, Guideline for Boundary Value Testing, Improved Equivalence ClassTesting: Weak Normal, Strong Normal, Weak Robust Equivalence Class Testing, Strong Robust Equivalence Class Testing, Edge Testing.

Unit III ADVANCED TEST PLANNING 9 Hrs

Decision Tabel Based Testing: Decision Tables, Decision Table Technique: Code Based Testing, Code Coverage Metrics, E.F Miller's Coverage Metrics BasisPath Testing.Object Oriented Testing, Data Flow Testing, Object Oriented Complexity Metrics

Unit IV NATURAL LANGUAGE INFERENCE 9 Hrs

Retrospective on Unit Testing, Traversing the Penulum, Specification Based Testing, Code Base Testing, Agile Testing, Integration Testing, Decomposition Based Integration Call Graph Based Integration, Path—Based Integration, MM Path Based Integration.

UnitV TEST AUTOMATION AND TOOLS 9 Hrs

ProblemStatement, ambiguity for Sentiment Analysis, Lexicons for Sentiment Analysis, Rule based Sentiment Analysis, Statistical Sentiment Analysis, Neural approches, Sentiment Analysis in different languages.

Total Hours: 45

Textbook:

A Craftsman's Approach, Software Testing, Fith Edtion June2021, CRC Press. Author: PaulC.J Paul C Jorgensen

References:

1.GlenfordJ.Myers, CoreySandler, TomBadgett, The Art of Software Testing,3rd Edition,2012, JohnWiley&Sons, Inc.

2. YogeshSingh, “SoftwareTesting”, Cambridge University Press, 2012.

3. UnmeshGundecha, SatyaAvasarala,"SeleniumWeb Driver 3 Practical Guide" –Second Edition 2018

4.Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing. ElfriedeDustin, Thom Garrett, BernieGaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc

COURSE CODE	COURSE NAME	GAME THEORY	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E02	Prerequisite:		TY	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To equip students with a comprehensive understanding of strategic decision-making, game-theoretic models, and their applications in economics, computer science, and social sciences, ensuring their competence in analyzing competitive and cooperative interactions.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Explain fundamental concepts of game theory, including players, strategies, payoffs, and Nash Equilibrium, and analyze different types of games.
CO2	Apply strategic-form game concepts, including pure and mixed strategies, dominant strategies, and Nash Equilibria, in real-world economic and computational contexts.
CO3	Analyze extensive-form games using game trees, backward induction, and Subgame Perfect Equilibrium to models equential decision-making processes.
CO4	Evaluate Bayesian games and mechanism design principles, including Bayesian Nash Equilibrium and auction models, for decision-making under in complete information.
CO5	Demonstrate an understanding of Evolutionary Game Theory, including evolutionarily stable strategies and replicator dynamics, and apply them to biological and social behavior models.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	3	2	1	1	2	1	2
CO2	3	3	2	2	3	2	1	1	2	1	3
CO3	3	3	3	2	3	1	1	1	2	1	2
CO4	3	3	2	3	3	2	2	2	3	2	3
CO5	3	2	2	2	3	2	1	1	2	1	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	1	2
CO2	3	2	3
CO3	3	3	3
CO4	3	2	3
CO5	3	3	3

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	GAME THEORY	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E02	Prerequisite:		TY	3	0/0	0/0	3

Unit I Introduction to GameTheory **9 Hrs**

players, strategies, payoffs – Types of games: cooperative vs. non-cooperative, zero- sumvs. non-zero-sum–Nash Equilibrium: definition and properties –Applicationsin economics and computer science

Unit II Strategic Form Games **9 Hrs**

Pure and mixed strategies –Dominant and dominated strategies –Mixed Strategy Nash Equilibrium: computation and interpretation – Applications in pricing strategies and auctions

Unit III Extensive Form Games **9 Hrs**

Gametrees and their representation–Backward induction–Subgame Perfect Equilibrium – Repeated games: finitely and infinitely repeated games

Unit IV Bayesian Games and Mechanism Design **9 Hrs**

Games within complete information–Bayesian Nash Equilibrium–Mechanism design and the Revelation Principle – Auctions: design and analysis – Applications in market design and voting systems

Unit V Evolutionary Game Theory **9 Hrs**

Evolutionarily Stable Strategies –Replicator dynamics–Applications in biology and social behavior – Learning in games: adaptive strategies and convergence

Total Hours : 45

Text book:

1. Game Theory: An Introduction"by StevenTadelis, 3rd Edition, Wiley, 2023

References:

1. MartinJ. Osborne," An Introduction to Game Theory", Oxford University Press, 2004
2. A Course in Game Theory"by MartinJ. Osborne and Ariel Rubinstein, 1994, mitpress
3. Game Theory: Analysis of Conflict"by Roger B. Myerson, Harvard University Press, 1991.
4. "GameTheory and Mechanism Design"byY.Narahari was first published in 2014 by World Scientific Publishing CompanyAlgorithmic Game Theory–N. Nisan, T. Roughgarden, É. Tardos, and V.V. Vazirani, 2007, 1st edition

COURSE CODE	COURSE NAME	Artificial Intelligence in Robotics	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E03	Prerequisite: Mathematics & Machine learning		TY	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To introduce the core concepts of AIthat are relevant to the field of robotics, including machine learning, reasoning, perception, and control systems.
To explore the integration of AI techniques (such as deep learning, reinforcement learning, and probabilistic reasoning) with robotic systems to enable autonomous behaviors.
To study robot perception systems, including sensory data processing and computer vision, and their role in robot navigation and decision-making.
To provide an understanding of motion planning and control algorithms, including path planning, trajectory generation, and AI-based decision-making.
To analyze the latest trends in multi-robot systems, swarm robotics, and autonomous systems, focusing on collaboration, communication, and distributed control.
To promote hands-on experimentation and problem-solving using AI algorithms in simulation or real-world robotic platforms, reinforcing theoretical knowledge.

COURSE OUTCOMES (Cos): Students will be able to

CO1	Understand and apply AI concepts in robotics, including search algorithms, machine learning, probabilistic reasoning, and decision-making in uncertain environments.
CO2	Design and implement robot perception systems by integrating sensors and AI algorithms for tasks such as object recognition, localization, and mapping.
CO3	Solve complex robotics problems involving robot autonomy, sensor fusion, and multi-robot coordination, ensuring robust performance in real-world applications.
CO4	Analyze and compare AI algorithms for robotics applications, including their strengths, weaknesses, and appropriate use cases in different robotic systems.
CO5	Communicate technical knowledge effectively, both in written and oral formats, through project reports, presentations, and collaborative teamwork in robotics design and developmen

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	2	1	23	2	2	2	3	1	2	3	
CO2	2	3	2	1	3	1	2	2	3	2	1	
CO3	1	2	3	2	1	3	2	3	2	3	2	
CO4	2	1	2	3	2	1	1	3	2	1	3	
CO5	3	3	1	2	2	2	2	3	3	13	2	

COs/PSOs	PSO1	PSO2	PSO3	
CO1	3	2	1	
CO2	2	3	2	
CO3	3	2	1	
CO4	1	2	3	
CO5	2	1	3	

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	Artificial Intelligence in Robotics	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E03	Prerequisite: Mathematics & Machine learning		TY	3	0/0	0/0	3

Unit I Introduction to Robotics and Artificial Intelligence **9 Hrs**

History and evolution of robotics, Types of robots: industrial, service, autonomous Key concepts: machine learning, reasoning, problem-solving, perception AI techniques applied in robotics Intelligent agents and their architectures Challenges and benefits of integrating AI in robotics Real-time decision-making systems in robots

Unit II Robot Perception and Sensing **9 Hrs**

Types of sensors: vision (cameras), touch, proprioception (force/torque), etc. Sensor fusion for perception Image processing techniques in robotics Object detection, tracking, and recognition SLAM (Simultaneous Localization and Mapping) Deep learning for robotic vision Perception-driven decision-making

Unit III Motion Planning and Control **9 Hrs**

Forward and inverse kinematics Robot configurations and control
Path planning: A* algorithm, Dijkstra's algorithm, RRT (Rapidly-exploring Random Trees) Optimization techniques for motion planningReinforcement learning for autonomous control Deep learning approaches for robot motion

Unit IV Robot Learning and Adaptation **9 Hrs**

Supervised and unsupervised learning Online learning and adaptive algorithms for robots Reinforcement Learning for Autonomous RobotsConcepts of reward, exploration vs. exploitation Applications in autonomous navigation and task learningGeneralizing learned behaviors to new environments or tasks

Unit V Autonomous Robots and Multi-Robot Systems **9 Hrs**

Autonomous navigation (e.g., self-driving cars, drones) Decision-making under uncertainty (partially observable environments Cooperative and competitive behavior in multi-robot systems Swarm robotics and applications Distributed control and communication AI safety, security concerns, and ethics in autonomous robots

Total Hours: 45

Text book:

1. Artificial Intelligence for Robotics: Build intelligent robots using ROS 2, Python, OpenCV, and AI/ML techniques for real-world tasks, Second EditionbyFrancis X. GoversIII, Packet Publisher. March 2024

2. Robotics: Modelling, Planning, and Control" (3rd Edition) by Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, and Giuseppe Oriolo, Springer Publisher 2025

References:

1 Artificial Intelligence for Robotics and Autonomous Systems Applications by Ahmad Taher Azar, Springer Publisher2023

2.Autonomous Robots: Modeling, Path Planning, and Control" (3rd Edition) by GeorgeA. BeckySpringer Publisher 2024

COURSE CODE	COURSE NAME	SOCIAL NETWORK ANALYSIS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E04	Prerequisite: Basic Knowledge of Graph Theory, Fundamentals of Data Mining		TY	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To provide students with a comprehensive understanding of Social Network Analysis (SNA), its key
concepts, methods, andapplications, enabling them to analyze and interpret social networks in various contexts.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Define key network concepts like nodes, ties, centrality, and cohesion.
CO2	Collect and organize network data from surveys, digital traces, and archives.
CO3	Use tools like Gephi and UCINET for network visualization and analysis.
CO4	Apply network measures such as degree and between nesscentrality.
CO5	Address ethical challenges in SNA, including privacy and bias.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	1	-	3	-	2
CO2	3	3	2	-	2	2	-	-	3	2	3
CO3	2	-	3	3	3	-	2	-	3	3	-
CO4	3	2	2	3	2	-	-	3	-	3	2
CO5	2	2	2	-	3	3	3	-	-	-	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	2	-
CO2	3	2	2
CO3	2	3	3
CO4	3	3	2
CO5	-	-	3

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical / Project
					√				

COURSE CODE	COURSE NAME	SOCIAL NETWORK ANALYSIS	Ty/Lb / ETL/IE	L	T/Slr	P/R	C
EBML24E04	Prerequisite: Basic Knowledge of Graph Theory, Fundamentals of Data Mining		TY	3	0/0	0/0	3

Unit I INTRODUCTION TO SOCIAL NETWORK ANALYSIS 9 Hrs

Understanding Networks: Nodes and ties - Historical Development - Types of Networks: Ego, Complete and affiliation networks - Social vs. technical networks – Basic network terminology - Key Concepts: Centrality, Density, Cohesion- Sociograms
And Network Diagrams-Data Sources for SNA

Unit II NETWORK MEASURES AND STRUCTURES 9 Hrs

Degree, betweenness, closeness, and eigen vector centrality-Structural holes and brokerage-Clustering coefficients and local structures-Cliques, cores, and components
-Strong and weak ties theory-Network density and cohesion-Sub group detection- Roles and positions in networks

Unit III NETWORK DATA COLLECTION AND VISUALIZATION 9 Hrs

Collecting network data from surveys and interviews-Archival data and digital platforms-Visualization principles in SNA-Force-directed layouts and algorithms-
Matrix-based vs. node-link diagrams – Interpreting sociograms – Using software: Gephi, NodeXL, UCINET - Pitfalls in visualization (overplotting, readability)

Unit IV MODELING AND ANALYZING NETWORKS 9 Hrs

Network models: Random graphs, small-world, scale-free - Diffusion and influence in networks - Communitydetectionandmodularity- Communitydetectionandmodularity - Multimodal and bipartite networks- Temporal (dynamic) networksand longitudinal SNA-Weightedanddirectednetworks-Introductiontoblockmodeling-Comparison Ofempirical vs simulated networks

Unit V APPLICATIONS AND ETHICS IN SOCIAL NETWORK ANALYSIS 9 Hrs

Applying SNA in sociology, politics, education, business - social media and online behavior analysis - Organizational and knowledge networks - Trust and influence in online communities - SNA for policy and decision-making - Fraud detection and security networks-Ethical challenges: privacy, anonymity, consent-Future directions
And trends in SNA research

Total Hours: 45

Text book:

1. Social Network Analysis: Research Methods, JohnScott, SAGE Publications, 2024
2. Analyzing Social Networks, Stephen P. Borgatti, Martin G. Everett, Jeffrey C. Johnson, SAGE Publications, 2022

References:

1. Network Analysis: Methodological Foundations, Ulrik Brandes, Thomas Erlebach, Springer, 2005
2. Social Network Analysis: A Handbook, JohnScott, PeterJ.Carrington, SAGE Publications, 2011

COURSE CODE	COURSE NAME	Image Processing	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E05	Prerequisite: Mathematics & Linear Algebra		TY	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand the fundamentals of image processing techniques.
To explore AI and ML techniques for image analysis.
To develop algorithms for image enhancement, segmentation, and recognition.
To apply AI/ML models for various image-processing applications.
To gain hands-on experience in implementing AI-powered image processing techniques

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand the fundamentals of digital image processing
CO2	Learn image enhancement and restoration techniques in spatial and frequency domains
CO3	Apply segmentation and feature extraction techniquesusing AI/ML
CO4	Analyze and implement AI/ML models for object detection and classification
CO5	Explore AI-driven applications in medical imaging, security, and automation

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	2	1	1	2	1	2	1	2
CO2	3	3	3	2	2	1	2	1	2	1	2
CO3	3	3	3	3	2	1	2	1	3	2	2
CO4	3	3	3	3	3	2	2	2	3	2	3
CO5	3	3	3	3	3	2	3	2	3	3	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	2	2
CO2	3	3	2
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	Image Processing	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E05	Prerequisite: Mathematics & Linear Algebra		TY	3	0/0	0/0	3

Unit I Fundamentals of Image Processing **9 Hrs**

Image Representation and Components, Image Sensing & Acquisition, Elements of Visual Perception, Image Sampling & Quantization, Relationship Between Pixels

Unit II Image Enhancement & Restoration **9 Hrs**

Histogram Processing & Point Processing, Spatial & Frequency Domain Filtering, Noise Models & Removal Techniques, Inverse Filtering & Geometric Mean Filter, Deep Learning-Based Image Enhancement

Unit III Image Segmentation & Feature Extraction **9 Hrs**

Edge Detection (Sobel, Canny), Region-Based Segmentation, Feature Descriptors (SIFT, ORB, HOG), Image Compression Techniques (Lossy & Lossless), AI-Based Segmentation (U-Net, Mask R-CNN)

Unit IV AI & ML in Image Processing **9 Hrs**

Introduction to Machine Learning for Images, Convolutional Neural Networks (CNNs), Transfer Learning (VGG, ResNet, MobileNet), Object Detection (YOLO, Faster R- CNN), Image Super-Resolution Using AI

Unit V Applications of AI in Image Processing **9 Hrs**

Medical Image Processing (MRI, X-ray Analysis), Autonomous Vehicles (Object Tracking), Facial Recognition & Emotion Detection, AI-Powered Image Synthesis (GANs, VAEs), Smart Surveillance & Security Systems

Total Hours: 45

Text book:

1. ErikCuevas, Alma Nayeli Rodríguez, Image Processing and Machine Learning, CRC Press, 2024
2. Karm Veer Arya, Ciro Rodriguez Rodriguez, Saurabh Singh, Abhishek Singhal, Artificial Intelligence and Machine Learning Techniques in Image Processing and ComputerVision, CRC Press, 2024

References:

1. Latief Ahmad, Nisar UlIslam, Machine Learning, Image Processing, Network Security and Data Sciences, Springer, 2023
2. StuartJ. Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson, 2020
3.RafaelC.Gonzalez•RichardE.Woods, 4thEdition, Digital Image Processing, Pearson2018

PROGRAM ELECTIVE – II
SYLLABUS

COURSE CODE EBML24E06	COURSE NAME: FEDERATED LEARNING	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: ML AND DL	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial, S. Lr: Supervised Learning, P: Project, R: Research, C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES:

The students should be made to

- Understand the fundamentals of Federated Learning and its advantages over traditional machine learning.
- Study the FL system architecture, including client-server and peer-to-peer models.
- Learn about future trends and advancements in Federated Learning.

COURSE OUTCOMES(COs): Students will be able to

CO1	Understand the fundamentals of Federated Learning and its advantages over traditional machine learning.
CO2	Describe the workflow of a Federated Learning (FL) system, from initialization to continuous operation.
CO3	Implement Client-Side Functionalities in Federated Learning
CO4	Discuss the significance of aggregation in distributed training and privacy-preserving AI
CO5	Understand the impact of FL in different industries and its advantages over traditional ML approaches.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	3	3	2	1	1	1		1		2	
CO2		2	2	1		1				1	2	
CO3	3		3	1	2	1			1		1	
CO4	2	3	3	1	1	2	1			1		
CO5	1	3	3	2	2	2			1	1		

COs/PSOs	PSO1	PSO2	PSO3	
CO1	3	3	2	
CO2		2	1	
CO3	2	3		
CO4		2	2	
CO5	3		2	

3/2/1 Indicates Strength of Correlation,3–High, 2-Medium, 1-Low:

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Inter Disciplinary	Skill Component	Practical/Project			
					√							

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24E06	FEDERATED LEARNING Prerequisite: ML AND DL	Ty	3	0/0	0/0	3

UNIT-I: FEDERATED LEARNING – CONCEPTUAL FOUNDATIONS 9 Hrs

Introduction to Federated Learning – Understanding the current state of ML - Challenges in Big Data and Traditional AI – Understanding the nature of big data – Data privacy as a bottleneck – Impacts of training data and model bias – Model drift and performance degradation – FL as the main solution for data problems.

UNIT-II: DESIGN AND IMPLEMENTATION OF THE FEDERATED LEARNING SYSTEM 9 Hrs

FL System Architecture – Understanding the FL System flow – from initialization to continuous operation – Basic of Model Aggregation – Furthering scalability with horizontal design – Federated Learning server implementation with python Implementing FL server – side functionalities – Maintaining models for aggregation with the state manager – Aggregating: Local Models – Running the FL Server.

UNIT-III: FEDERATED LEARNING CLIENT – SIDE IMPLEMENTATION 9 Hrs

Overview of FL Client-side Components – Implementing FL Client-side functionalities – Designing FL Client Libraries – Local ML Engine Integration into an FL system –Running the Federated Learning System and Analyzing the Result – Configuring and running the FL system – Understanding what happens when the minimal examples – Running image classification and analyzing the results.

UNIT-IV: MODEL AGRREGATION 9 Hrs

Introduction of Model Aggregation – Revisiting Aggregation Understanding Fed Avg – Modifying, Aggregation for non-ideal cases – Moving Towards the production of Federated Learning Applications – Introducing Existing Federated Learning Frameworks – The Production of Training of an NLP Model.

UNIT-V: CASE STUDIES OF FEDERATED LEARNING & FUTURE TRENDS 9 Hrs

Case Studies with use cases of Federated Learning Application – Applying FL to the health care sector – Applying FL to the Financial Sector – FL meets Edge Computing – Moving toward the Internet of Intelligence – Applying FL to distributed learning for big data – Future Trends and Development – Future AI Trends.

Total Hours:45

TEXT BOOKS:

1. "Federated Learning with python" – KiyoshiNakayama, George – Packt – 2022.

REFERENCE BOOKS:

1. Federated Learning Fundamentals and Advances" - Yaochu Jin, Hangya Zhu, etal, -Springer -2023.
2. "Federated Learning comprehensive overview of methods and applications" - Heiko Ludwig, Nathalie Baracaldo - Springer - 2022.

COURSE CODE	COURSE NAME	AUGMENTED AND VIRTUAL REALITY	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E07	**Prerequisite: Computer Graphics**		Ty	3	0	0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

- To introduce the fundamental concepts, evolution, and differences between Augmented Reality (AR), Virtual Reality (VR)
- To familiarize students with the hardware and software components of AR/VR systems including head-mounted displays (HMDs), sensors, cameras, and development platforms.
- To train students in using tools like Unity3D, Unreal Engine, ARKit, and ARCore to build interactive AR/VR applications.
- To enable students to design 3D virtual environments and implement immersive experiences using animation, audio, and interaction design.
- To develop students' understanding of key AR/VR techniques such as tracking, rendering, and computer vision.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Describe the basic concepts, history, and applications of Augmented Reality (AR) and Virtual Reality (VR).
CO2	Explain the architecture and components of AR and VR systems, including hardware, software, and sensors.
CO3	Develop basic AR/VR applications using tools like Unity3D, ARCore, ARKit, or Unreal Engine.
CO4	Create interactive 3D environments by integrating models, textures, animations, and spatial audio.
CO5	Apply computer vision techniques such as image tracking and SLAM in AR development.

Mapping of Course Outcome with Program Outcome (POs):

Cos/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	1	-	3	-	2
CO2	3	3	2	-	2	2	-	-	3	2	3
CO3	2	-	3	3	3	-	2	-	3	3	-
CO4	3	2	2	3	2	-	-	3	-	3	2
CO5	2	2	2	-	3	3	3	-	-	-	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	2	-
CO2	3	2	2
CO3	2	3	3
CO4	3	3	2
CO5	-	-	3

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	AUGMENTED AND VIRTUAL REALITY	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E07	Prerequisite: Computer Graphics		Ty	3	0	0	3

Uni-1: Introduction to Augmented & Virtual Reality **10 hrs**

Definition and Scope of AR, VR, and Mixed Reality (MR), Evolution and History of AR/VR, Differences between AR, VR, and MR, Applications of AR/VR in Healthcare, Education, Digital Forensics, Gaming, etc. Challenges and Future of AR/VR

Unit-2: AR/VR Hardware & Software **8 hrs**

AR/VR Headsets: Oculus, HTC Vive, HoloLens, Magic Leap, Sensors and Input Devices: IMU, LiDAR, Motion Tracking, Hand Tracking, Development Platforms: Unity, Unreal Engine, SDKs and APIs: ARKit, ARCore, Vuforia, OpenXR, Cloud AR and WebAR

Unit-3: 3D Graphics & Interaction in AR/VR **9 hrs**

Basics of 3D Graphics: Rendering, Texturing, Shaders, Spatial Mapping and Object Tracking, Human-Computer Interaction (HCI) in AR/VR, UI/UX Design Principles for Immersive Environments, Gesture Recognition, Eye Tracking, and Haptics in AR/VR

Unit-4: Augmented Reality Development **10 hrs**

Marker-based vs. Markerless AR, Image Recognition and Object Tracking in AR, AR Cloud and Persistent AR, Hands-on: Building an AR Application using ARKit/ARCore, Case Study: AR in Healthcare & Medical Imaging

Unit-5: Virtual Reality Development **8 hrs**

3D Scene Creation and Navigation in VR, Physics & Object Interaction in Virtual Environments, VR Locomotion Techniques: Teleportation, Smooth Movement, Designing for Immersion and Presence in VR, Hands-on: Developing a VR Experience in Unity/Unreal, Case Study: VR in Training and Rehabilitation

Text Books: **Total Hours: 45**

1. Creating Augmented and Virtual Realities: Theory and Practice for Next-Generation Spatial Computing Paperback – Import, 14 May 2019 by Erin Pangilinan, Steve Lukas, Vasanth Mohan, O'reilly publications
2. Master AR & VR: A Beginner's Guide to Building Immersive Interactive Experiences Kindle Edition by STEM SCHOOL, Kindle Edition

Reference Books:

1. Augmented Human: How Technology Is Shaping the New Reality, 2017, by Helen Papagiannis, O'reilly publications
2. Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile, 2015 by Tony Parisi O'reilly publications
3. Augmented Reality with Unity AR Foundation, 2021 by Jonathan Linowes, Packt Publishing

COURSE CODE	COURSE NAME	SOFTWARE QUALITY ASSURANCE	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E08	Prerequisite: Object Oriented Software Engineering		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The object of Software Quality Assurance (SQA) is to establish systematic processes, methodologies, and standards to ensure that software products meet predefined quality criteria.

The main focus is on preventing defects, improving reliability, and ensuring compliance with industry standards.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand the Fundamentals of Software Quality Assurance
CO2	Apply Software Testing Techniques
CO3	Ensure Software Reliability and Performance
CO4	Implement Quality Control and Risk Management
CO5	Improve Software Development and Maintenance Processes

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	0	2	0	0	0	0	0
CO2	3	3	3	2	3	0	0	0	1	0	0
CO3	2	3	2	3	1	0	0	2	0	0	0
CO4	1	2	1	3	3	0	0	0	2	0	0
CO5	2	2	3	1	1	3	0	0	2	0	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	3	3	2
CO3	2	3	2
CO4	2	3	3
CO5	3	2	3

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	SOFTWARE QUALITY ASSURANCE	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E08	Prerequisite: Object Oriented Software Engineering.		Ty	3	0/0	0/0	3

Unit I Introduction to Software Quality and Software Quality Assurance 9 Hrs

Introduction- The unique Nature of Software Quality Assurance, Definition and Role of Software in SQA, An Overview: Software Errors, Faults and Failures.Classification of the causes behind software errors. Software quality: definition, scope.SQA – definition objectives, importance. The need for well defined software quality requirements, Classifications of software requirements into software quality factors, Ensuring Software Compliance with quality factors.

Unit II Software Testing Principles and Approaches 9 Hrs

Fundamentals of Testing Theory, Power of Test Methods, Testing Adequacy and its Limitations- Types of Testing Techniques: Unit Testing, Control Flow Testing, Data Flow Testing, Domain Testing-System Integration Testing: Integration Testing Concepts, System Integration Techniques, Categories of SystemTests-Functional Testing Strategies.

Unit III Software Reliability and International Quality Standards 9 Hrs

Software Reliability: Definition and Concepts, key factors affecting Software Reliability, Applications and importance of Software Reliability- Comparison of Software Engineering Technologies, Monitoring Progress in System Testing, operational control of software systems. Operational Profiles in software reliability: Representation of Operational Profile-ISO9126: Quality Characteristics-ISO 9000:2000 Software Quality Standard: principles, fundamentals and requirements.

Unit IV Monitoring, Measurement and Risk Management in Quality Assurance 9 Hrs

QA Monitoring and Measurement: Direct vs. indirect quality measurements, Immediate Follow-up Actions and Feedback mechanism, Analysis Procedures and Follow-up Actions-Implementation Srategies, Integration and Tool Support-Risk Identification and Analysis: Basic Ideas and Concepts, Traditional Statistical Analysis Techniques, Emerging Techniques for Risk Identification, Risk Identification based on Classified Defect Data.

Unit V Software project management, planning and quality enchancement 9 Hrs

Essentials of Project management: Risk management in software projects, Managing human resources and teams, FosteringTeamwork and Colloboration. Project planning Techniques: Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques. Quality management: Software quality, Software standards, Configuration Management-Process improvement-The process improvement framework, measuring software Processes, Process analysis techniques, managing Process change and continuous improvement.

Total Hours: 45

Text book:

StephanGoericke(2019), " The Future of Software Quality Assurance", publisher: Springer.

References:

1. JeffTian (2017)," Software Quality Engineering: Testing, Quality Assurance and Quantifiable Improvement",1st Edition, Publisher: Wiley-IEEE Computer Society Press.
2. DanielGalin(2008),"Software Quality Assurance: FromTheory to Implemetation", publisher: Addison-Wesley.
3. Priyadarshi Tripathy (2008)," Software Testing and Quality Assurance: Theory and Practice",1st Edition, Publisher: Wiley-Spektrum.

PTripathy (2015),"Software Evolution and Maintenance-A Practitioner's Approach",1st Edition, Publisher: John Wiley & Sons Inc.

COURSE CODE	COURSE NAME	MACHINE LEARNING BIO - MEDICAL IMAGING	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E09	**Prerequisite: Introduction to Machine Learning, Python Programmming, Basic Knowledge of medical Imaging, Linear Algebra and Statistics**		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

- Understand the principles of image processing in medical imaging.
- Apply machine learning algorithms to biomedical image datasets.
- Develop models to classify, segment, and analyze medical images.
- Evaluate the performance of models in a medical context.
- Understand ethical and regulatory issues involved in medical imaging.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understanding the medical imaging and machine learning
CO2	Designing the image processing and Feature engineering
CO3	Analyzing Machine Learning models for medical imaging
CO4	Model Evaluation and Validation of CNN
CO5	Analysing Deep Learning and Neural Networks in Medical Imaging

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	3	2	1	1	1	1	2
CO2	3	3	2	3	2	2	1	1	1		2
CO3	2	2	3	3	3	2	2	1	1	1	
CO4	3	3	3	3	3	3	2	2	1	1	3
CO5	3	2	3	3	3	3		2	2	2	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	3	3	1

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	MACHINELEARNING BIO-MEDICAL IMAGING	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E09	**Prerequisite: Introduction to Machine Learning, Python Programmming, Basic Knowledge of medical Imaging, Linear Algebra and Statistics**		Ty	3	0/0	0/0	3

Unit I Fundamentals of Medical Imaging and MachineLearning **9 Hrs**

Introduction to medical imaging modalities (X-ray, CT, MRI, Ultrasound, PET)-Basics of image processing and computer vision-Fundamentals of machine learning-Supervised Learning-Unsupervised Learning- Reinforcement Learning -Overview of deep learning (Neural Networks, CNNs, RNNs)-Applications of AI in medical imaging

Unit II Image Preprocessing and Feature Engineering **9 Hrs**

Image enhancement and denoising (Filtering, Histogram Equalization)-Image sgmentation techniques (Thres holding, Region-based methods)-Feature extraction (Edges, Textures, Shapes)-Dimensionality reduction techniques-PCA-LDA- Auto encoders-Data augmentation and synthetic data generation

Unit III Machine Learning Models for Medical Imaging **9 Hrs**

Classical ML approaches (SVM, Decision Trees, Random Forests) -Convolutional Neural Networks (CNNs) and theirarchitectures-Transferlearningwith pre-trained models (ResNet, VGG, Inception)-Generative models (GANs, VAEs) for synthetic Image generation-Explainability and interpretability of AI models (Grad-CAM, SHAP)

Unit IV Applications in Disease Detection and Diagnosis **9 Hrs**

Tumor classification using CNNs-lung disease and COVID-19 detection from X-rays- Brain tumor and stroke detection using MRI segmentation-Diabetic retinopathy detection from retinal images-Cardio vascular disease prediction from echocardiography

Unit V Future Trends in AI for Medical Imaging **9 Hrs**

Bias and fairness in AI- based heal thc are systems- Regulatory frameworks (FDA, CE, HIPAA compliance) – Privacy and security concerns in medical AI-Federated learning and decentralized AI in health care- Future trends: AI-powered robotic surgery, multi-modalimaging, and quantum computing

Total Hours: 45

Text book:

1."Machine Learning Techniques for Medical Imaging"Hayle Medical, 26 September 2023, Hubert Henso

References::

1. "Biomedical Imaging-Advances in Artificial Intelligence and Machine Learning"-Springer 2024, AnukurGogoii, Nirmal Mazumder
2. "Biomedical Image Analysis, Special Applications in MRIs and CTscans"-Springer National 2024, Pritpal Singh
3. "Deep Learning in Biomedical Signal and Medical Imaging" -CRCPress2024, Ngangbam Herojit Singh, Utku Kose, and Sarada Prasad Gochhayat
4. "Machine Learning in Healthcare, Fundament as ls and Recent Applications"-CRC Press 2022 , BikeshKumarSingh, G.R. Sinha

COURSE CODE	COURSE NAME	PATTERN RECOGNITION	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E10	Prerequisite: Machine Learning		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to:

- Understand the in-depth concept of Pattern Recognition
- Implement Bayes Decision Theory
- Understand the in-depth concept of Perception and related Concepts
- Understand the concept of ML Pattern Classification
- Understand the concept of DL Pattern Recognition

COURSE OUTCOMES (Cos): Students will be able to

CO1	Discover imaging, and interpretation of temporal patterns
CO2	Identify Structural Data Patterns.
CO3	Implement Pattern Classification using Machine Learning Classifiers
CO4	Implement Pattern Recognition using Deep Learning Models
CO5	Implement Image Pattern Recognition

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	2	2	2	3	2	1	1	2	1	1	-	
CO2	3	2	3	2	2	1	-	2	1	1	-	
CO3	2	3	3	2	2	2	-	2	1	1	-	
CO4	3	2	2	3	2	2	1	1	1	1	-	
CO5	3	2	3	2	2	1	1	1	1	1	-	

COs/PSOs	PSO1	PSO2	PSO3	
CO1	2	2	2	
CO2	3	2	3	
CO3	2	3	3	
CO4	2	3	3	
CO5	2	2	3	

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical / Project
					√				

COURSE CODE	COURSE NAME	PATTERN RECOGNISATION	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E10	Prerequisite: Machine Learning		Ty	3	0/0	0/0	3

Unit I PATTERN RECOGNITION **9 Hrs**

Induction Algorithms: Rule Induction- Decision Trees-Bayesian Methods-Overview: NaïveBayes- The Basic Naïve Bayes Classifier- Naive Bayes Induction for Numeric Attributes-Correction to the Probability Estimation- Laplace Correction- No Match- Other Bayesian Methods- Neural Networks-Genetic Algorithms-Instance-based Learning- Support Vector Machines.

Unit II STATISTICAL PATTERN RECOGNITION **9 Hrs**

Introduction about Statistical Pattern Recognition - Classification and regression -Features, Feature Vectors, and Classifiers - Pre-processing and feature extraction - The curse of dimensionality - Polynomial curve fitting - Model complexity - Multivariate non-linear functions- Bayes' theorem - Decision boundaries - Parametric methods- Sequential parameter estimation- Linear discriminant functions- Fisher's linear discriminant - Feed-forward network mappings.

Unit III BAYES DECISION THEORY CLASSIFIERS **9 Hrs**

Bayes Decision Theory - Discriminant Functions and Decision Surfaces - The Gaussian Probability Density Function - The Bayesian Classifier for Normally Distributed Classes - Exact interpolation - Radial basis function networks - Network training - Regularization theory - Noisy interpolation theory - Relation to kernel regression - Radial basis function networks for classification - Comparison with the multi-layer perceptron - Basis function optimization.

Unit IV LINEAR DISCRIMINANT FUNCTIONS **9 Hrs**

Linear Discriminant Functions and Decision Surfaces - The Two-Category Case - The Multicategory Case - The Perceptron Criterion Function - Batch Perceptron. Perceptron Algorithm Convergence - The Pocket Algorithm - Mean Square Error Estimation - Stochastic Approximation and the LMS Algorithm - Convergence Proof for Single-Sample Correction - Fixed increment descent - Some Direct Generalizations - Fixed increment descent - Batch variable increment Perceptron - Balanced Winnow algorithm - Relaxation Procedures - The Descent Algorithm.

Unit V NONLINEAR CLASSIFIERS **9 Hrs**

The Two Layer Perception - The Three Layer Perception - Algorithms Based On Exact Classification of the Training Set - Feedforward operation and classification - General feedforward operation - Expressive power of multilayer networks - Backpropagation algorithm - Network learning - Training protocols - Stochastic Backpropagation - Batch Backpropagation - Radial basis function networks (RBF) - Special bases - Time delay neural networks (TDNN) - Recurrent networks - Counter propagation - Cascade-Correlation - Cascade-correlation – Noncognition.

Total Hours: 45

Text book:

1. C.M. Bishop, Pattern Recognition and Machine Learning, Springer, 2017
2. Practical Machine Learning and Image Processing, Himanshu Singh. Apress, 2019

References:

1. Pattern Recognition, Jürgen Beyerer, Matthias Richter, and Matthias Nagel. 2018
2. Pattern Recognition and Classification, Dougherty, and Geoff. Springer, 2013.
3. Pattern Recognition and Machine Learning, Christopher M. Bishop. Springer, 2010

PROGRAM ELECTIVE – III
SYLLABUS

COURSE CODE	COURSE NAME	Streaming Data Analytics	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E11	Prerequisite: Big Data Analytics and Machine Learning		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

Introduce students to the foundational concepts and terminology of stream processing, emphasizing the distinctions between processing time and event time.

Equip students with the knowledge to apply temporal progress metrics, such as watermarks, and to implement advanced windowing strategies for managing complex streaming scenarios.

Enable students to address challenges in achieving exactly-once processing semantics and to analyze data processing frameworks through the streams-and-tables paradigm.

Prepare students to manage persistent state in streaming pipelines and to integrate streaming concepts within relational algebra and SQL.

Develop students' ability to analyze various join types in streaming contexts and to understand the evolution of data processing systems, particularly the MapReduce lineage.

COURSE OUTCOMES (Cos): Students will be able to

CO1	Understand the basics of stream processing, including key terminology and the distinctions between processing time and event time.
CO2	Apply temporal progress metrics like watermarks and implement advanced windowing strategies to manage complex streaming scenarios.
CO3	Address challenges in achieving exactly-once processing semantics and analyze data processing frameworks through the streams-and-tables paradigm.
CO4	Manage persistent state in streaming pipelines and integrate streaming concepts within relational algebra and SQL.
CO5	Analyze various join types in streaming contexts and understand the evolution of data processing systems, particularly the MapReduce lineage.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	2	1	1	-	1	1	2
CO2	3	3	2	2	3	1	-	-	-	1	2
CO3	3	3	3	3	3	-	-	1	-	-	2
CO4	3	3	3	3	3	-	-	1	-	1	2
CO5	3	3	2	2	3	1	-	-	1	1	2

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	1	2
CO2	3	2	2
CO3	3	3	3
CO4	3	3	3
CO5	2	2	2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical / Project
					√				

COURSE CODE	COURSE NAME	Streaming Data Analytics	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E11	Prerequisite: Big Data Analytics and Machine Learning		Ty	3	0/0	0/0	3

Unit I Fundamentals of Stream Processing **9 Hrs**

Introduction to Data Processing: Batch vs. Stream Processing, Terminology and capabilities of streaming systems, Understanding processing time vs. event time, Common data processing patterns, Handling out-of-order data, Temporal progress metrics and watermarking, Advanced windowing strategies: processing-time windows, sessions, continuation triggers, Data Migration Strategies, Transactional Data Processing, Data Mining Techniques

Unit II Watermarks and Advanced Windowing **9 Hrs**

Deep survey on Temporal Progress Metrics, Introduction to Watermarks, Creation of Watermarks, Propagation of Watermarks, Real-World Implementations of Watermarks. Advanced Windowing Concepts, Processing-Time Windows, Session Windows, Combining Windows and Triggers

Unit III Exactly-Once Processing and Streams-Tables Duality **9 Hrs**

Challenges of Exactly-Once Processing, Implementation in Apache Flink, Implementation in Apache Spark, Implementation in Google Cloud Dataflow, Introduction to Streams and Tables Paradigm, Historical Perspective, Analyzing Classic Data Processing Approaches, Streams and Tables in the Beam Model, Extending Beyond Beam, Practical Applications.

Unit IV Persistent State and Streaming SQL **9 Hrs**

Motivations for Persistent State in Streaming Pipelines, Types of Implicit State, Practical Use Cases, Characteristics of State Management Mechanisms, Integration of Streaming with Relational Algebra, Streaming SQL, Contrasting Inherent Biases, Proposed Paths for Robust Streaming Semantics in SQL, Challenges in State Management, Case Studies of Streaming SQL Implementations.

Unit V Streaming Joins and Evolution of Data Processing **9 Hrs**

Overview of Join Types in Streaming, Temporal Joins, Temporal Validity Windows, Challenges in Streaming Joins, State Management for Joins, Performance Optimization, Evolution of Data Processing Systems, MapReduce Paradigm, Advancements in Streaming Systems

Total Hours : 45

Text book:

1.Tyler Akidau, Slava Chernyak, and Reuven Lax, “Streaming Systems: The What, Where, When, and How of Large-Scale Data Processing”, O’Reilly, 2024.

References:

1. Josh Fischer and Ning Wang,” Grokking Streaming Systems: Real-time event processing”, Manning Publications, 2021.
2. Andrew G. Psaltis, “Streaming Data: Understanding the real-time pipeline”, Manning Publications, 2017.
3. James Warren and Nathan Marz, “Big Data: Principles and best practices of scalable realtime data systems”, Manning Publications, 2015.

COURSE CODE	COURSE NAME	PROBABILISTIC ALGORITHMS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E12	Prerequisite: PROBABILITY, DESIGN AND ANALYSIS OF ALGORITHM		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To Evaluate Algorithm Performance To
Assess Algorithm Reliability
To Compare AlgorithmEfficiency

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand probability theory concepts fundamentals
CO2	Apply probabilistic tools and techniques
CO3	Design and analyze randomized algorithms
CO4	Analyze algorithms using probabilistic techniques
CO5	Evaluate the trade-offs between algorithmic complexity and probabilistic guarantees

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	2	3	2	2	3	2	3
CO2	3	3	3	3	3	3	1	2	-	2	3
CO3	3	3	3	3	3	3	1	1	2	-	2
CO4	3	3	3	3	3	3	-	1	2	2	3
CO5	3	3	3	3	3	3	1	-	1	1	2

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	2	3	2

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	PROBABILISTIC ALGORITHMS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E12	Prerequisite: PROBABILITY, DESIGN AND ANALYSIS OF ALGORITHM		Ty	3	0/0	0/0	3

Unit I Introduction **9 Hrs**

Introduction: Criteria for the performance and quality of Algorithms- Analysis of algorithm Introduction to Asymptotic - Notations-Summation-Euler's Summation Formula-Generating Functions: Elementary Properties and Applications-Lagrange Expansion and Applications PoissonTransform-Integral Transforms: Laplace-Mellin

Unit II Combinatorial calculus **9 Hrs**

Combinatorial Calculus: Elementary Examples -Admissible combinatorial constructions-operator methods-Asymptotics from generating functions: Complex functions-Expansions at singularities-Entire Functions- Representation of Algorithm by a Markov Chain- Inequalities for sum of bounded Random Variables-Wald's Identity

Unit III Algorithms over permutations **9 Hrs**

Algorithms over permutations: MAX-Locating the Largest term in a Permutation- Representations of Permutations-Cycles in a permutation- Inversions-Analysis ofsorting Algorithm: Insertion Sort-Shell Sort –Linear Probing Sort

Unit IV Algorithms for Communications Networks **9 Hrs**

Algorithms for Communications Networks: Efficiency of Multiple Connections- Disjointly Shared Channels-Counting Realizable Configurations-Asymptotic Capacity Estimates-Collision Resolution Stack Algorithms-Channel Capacity Analysis-Topof Stack Probabilities and Message Delay-Message Delay via Renewal Considerations

Unit V Bin Packing Heuristics **9 Hrs**

Bin Packing Heuristics: Next-Fit Bin Packing Algorithm-Regularity and convergence Properties-Next Fit-Expected Values-next –Fit –Decreasing Bin Packing Algorithm- Direct Evaluation of Bin Requirements-Asymptotic Bounds on Moments.

Total Hours : 45

Textbook:

1.MichaHofri, "PROBABILISTIC ANALYSIS OF ALGORITHMS ", Springer-Verlag ,2024

References:

1. Michael Mitzenmacher, EliUpfal, "Probability and Computing–Randomized Algorithms and Probabilistic Analysis ", Cambridge University Press, 2005.
2. Tim Roughgarden "Beyond the worst-Case Analysis of Algorithms", Cambridge University Press 2021

COURSE CODE: EBML24E13	COURSE NAME: BLOCK CHAIN AND ARTIFICIAL INTELLIGENCE INTEGRATIVES	TY/Lb / ETL/IE	L	T/ S. Lr	P/R	C
	Prerequisite: Artificial Intelligence, Block Chain Technology	Ty	3	0/0	0/0	3

L: LectureT: Tutorial S.Lr: Supervised LearningP: Project R: Research C: CreditsTy/Lb/ETL: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The student should be made to

- Understand the fundamental knowledge in block chain and AI
- acquire advanced skills in bitcoin and cryptocurrency with AI
- acquire advanced skills of hyperledger fabric &ethereum with AI.
- acquire advanced skills in block chain and AI to improve security systems
- gain the ability to strategically integrate cutting-edge technologies into various business workflows.

COURSE OUTCOMES(COs): Students will be able to

CO1	Understand the fundamental knowledge in block chain and AI
CO2	acquire advanced skills in bitcoin and cryptocurrency with AI
CO3	acquire advanced skills of hyperledger fabric & ethereum with AI
CO4	acquire advanced skills in block chain and AI to improve security systems.
CO5	gain the ability to strategically integrate cutting-edge technologies into various business workflows.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	2	1	1	2	1	1	-	1	1	2	
CO2	3	3	2	2	3	1	-	-	-	1	2	
CO3	3	3	3	3	3	-	-	1	-	-	2	
CO4	3	3	3	3	3	-	-	1	-	1	2	
CO5	3	3	2	2	3	1	-	-	1	1	2	

COs/PSOs	PSO1	PSO2	PSO3	
CO1	1	1	-	
CO2	1	1	-	
CO3	3	-	3	
CO4	3	1	3	
CO5	3	3	3	

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering	Humanities and social	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
					√							

COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/S.Lr	P/R	C
EBML24E13	BLOCK CHAIN AND ARTIFICIAL INTELLIGENCE INTEGRATIVES	Ty	3	0/0	0/0	3

UNIT-I: INTRODUCTION TO BLOCKCHAIN AND AI **9 Hrs**

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions-The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree. Machine learning basics- supervised-unsupervised-reinforcement learning-techniques.

UNIT-II: BITCOIN AND CRYPTOCURRENCY WITH AI **9 Hrs**

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay, AI-powered crypto trading bots-automated market making - fraud detection in Bitcoin transactions - Sentiment analysis - cryptocurrency price prediction.

UNIT-III: HYPERLEDGER FABRIC & ETHEREUM WITH AI **9 Hrs**

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity, AI-driven autonomous smart contracts for automation - self-learning DApps for adaptive decision-making- DeFi risk assessment - fraud detection.

UNIT-IV: ENHANCING SECURITY **9 Hrs**

Addressing digital system vulnerabilities with blockchain and AI-driven solutions. Implementing smart contracts for security automation-AI-driven threat detection and response systems- security threat in decentralized automation solutions. Post-quantum secure consensus mechanisms -NTRU-based schemes, Lattice-Based Cryptography (LBC)

UNIT-V: INDUSTRIAL APPLICATIONS **9 Hrs**

Security of smart contracts, Truffle Design and issue- DApps- NFT, Practical applications in financial services-Numerai-Cindicator-Erasure, healthcare-BurstIQ, and supply chain management.Real-world case studies showcasing AI-block chain integration.

Total Hours:45

TEXTBOOKS:

1. Bashir, I. (2020). Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more. Packt Publishing Ltd.
2. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly, 2014.
3. Kumble, G. P. (2020). Practical Artificial Intelligence and Blockchain: A guide to converging blockchain and AI to build smart applications for new economies. Packt Publishing Ltd.

REFERENCE BOOKS:

1. Goundar, S., & Anandan, R. (Eds.). (2023). Integrating Blockchain and Artificial Intelligence for Industry 4.0 Innovations. Springer Nature.
2. Prusty, N. (2017). Building blockchain projects. Packt Publishing Ltd.
3. Infante, R. (2019). Building Ethereum Dapps: decentralized applications on the Ethereum blockchain. Simon and Schuster.
4. Andreas C. Muller, "Introduction to Machine Learning with Python: A Guide for DataScientists", O'Reilly, 2016.
5. SebastianRaschka, "Python Machine Learning", Packet Publishing,2015.
6. StephenMarsland, "MachineLearning–An Algorithmic Perspective", CRCPress,2009.
7. SaikatDutt, Subramanian Chandramouli, AmitKumarDas, "Machine Learning", Pearson Education, 2018.
8. ChristopherBishop, "Pattern Recognition and Machine Learning" Springer,2011.

PRACTICAL SESSIONS:

Introduction to Block chain and AI Integration Lab

1: Setting up the Development Environment Lab
2: Understanding Block chain Basics Lab
3: AI Integration in Block chain (Smart Contracts)

Enhancing Security with AI in Block chain Lab

4: Securing Block chain Transactions with AI Lab
5: Implementing AI-Based Identity Verification Lab
6: Anomaly Detection and Intrusion Prevention

Data Analysis and AI in Block chain Lab

7: Extracting Insights from Block chain Data Lab
8: Implementing Predictive Analytics Lab
9: Natural Language Processing for Block chain Data

AI-Driven Block chain Applications Lab

10: Developing AI-Powered DApps (Decentralized Applications) Lab
11: AI for Supply Chain Management on Block chain Lab
12: Mini Project related to healthcare, and supply chain management and Real-world case studies showcasing AI-block chain integration

COURSE CODE	COURSE NAME	PREDICTIVE ANALYTICS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E14	Prerequisite: BIG DATA ANALYTICS		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

Learn fundamental concepts of Predictive analytics, acquire knowledge about Feature selection, Time series analysis and forecasting methods and design and analyse Predictive techniques

COURSE OUTCOMES(Cos): Students will be able to

CO1	Remember the fundamental concepts of Predictive analytics
CO2	Understand the pre-processing of the data and importance of feature selection
CO3	Gethands-on practice with Predictive modeling techniques
CO4	Acquire skills in Time series analysis and forecasting
CO5	Appy Predictive analytics toreal-world problems using analytics software

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	3	3	2	2	2	2	3
CO2	3	2	2	3	3	2	2	2	2	2	2
CO3	3	3	3	3	3	3	3	3	3	2	3
CO4	3	3	3	3	3	3	3	3	3	2	3
CO5	3	3	3	3	3	3	3	3	3	2	3

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	2
CO3	2	2	3
CO4	2	3	3
CO5	2	2	3

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	PREDICTIVE ANALYTICS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E14	Prerequisite: BIG DATA ANALYTICS		Ty	3	0/0	0/0	3

Unit I Introduction to Predictive Analytics **9 Hrs**

Overview of Predictive Analytics - The CRISP - DM Process Model for Predictive Analysis - Data in Predictive Analysis - Data Understanding - Data Visualisation - The value of Statistical Significance - Statistical concepts and tools for Predictive Analysis.

Unit II Data Preparation and Feature Selection **9 Hrs**

Importance of data quality for Predictive Analysis - Data Preparation - Data pre- processing - Dealing with missing data and outliers - Feature selection/Creation techniques - Exploratory data analysis for predictive modeling.

Unit III Predictive Modeling Techniques **9 Hrs**

Introduction to Modeling - Descriptive Modeling - Data preparation issues with Descriptive Modeling - Predictive Modeling techniques - Decision Tree - Logistic Regression - Neural Network Model - K-Nearest Neighbours - Naïve Bayes -Regression Models - Linear Regression - Other Regression Algorithms - Parameter tuning and hyper parameter optimization-Evaluating model performance and meterics- Model Ensembles-Mixture of Experts.

Unit IV Time Series Analysis and Forecasting **9 Hrs**

Introduction to Time Series Analysis and Forecasting - Components of time series - Trend and Seasonality analysis - ARIMA, LSTM modeling and forecasting - Exponential smoothing techniques - Model Evaluation - Applications.

Unit V Advanced Topics in Predictive Analysis **9 Hrs**

Deep Learning and its applications in Predictive Analysis - Unsupervised Learning Techniques - Clustering and Association Rule Mining - Ensemble Learning and Model Stackingtechniques-Transfer Learning-Ethical and Legal consideration sin Predictive
Analysis -Casestudies.

Total Hours: 45

Text book:

1. DeanAbbott, Applied Predictive Analytics-Principles and Techniques for the Professional Data Analyst, Wiley, 2014
2. DanielT. Larose, ChantalD. Larose, Data Mining and Predictive Analytics, Wiley, 2015.

References:

1. AnasseBari, MohammadChaouchi, TommyJung, Predictive Analytics for Dummies, Second Edition, Wiley, 2017
2. Alberto Cardoba, Understanding the Predictive Analytics Life cycle, Wiley, 2014
3. Jiawei Han and MichelineKamber, Data Mining Concepts andTechniques, Third Edition, Elsevier, 2012
4. GarethJames, Daniela Witten, TrevorHastie, RobertTibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2013.

COURSE CODE: EBML24E15	COURSE NAME: PRIVACY ENGINEERING	Ty/Lb/ ETL/IE	L	T / S. Lr	P/ R	C
	Prerequisite: AI & CYBER SECURITY	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL/IE: Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE:
The students should be made to

- Understand the fundamental concepts and challenges in privacy engineering.
- Learn various privacy-preserving techniques, cryptographic methods, and privacy-enhancing technologies.
- Gain knowledge of global privacy regulations, compliance strategies, and ethical considerations.
- Integrate privacy principles into software development and data management.
- Analyze case studies and real-world applications of privacy engineering in organizations.

COURSE OUTCOMES (COs): Student**s** will be able to

CO1	Understand the fundamental concepts and challenges in privacy engineering. [L1]
CO2	Lean privacy risks and implement mitigations in compliance with global privacy regulations. [L2]
CO3	Utilize privacy-preserving technologies such as differential privacy, encryption, and federated learning. L3]
CO4	Ensure compliance with global privacy laws, ethical guidelines, and industry best practices. [L5]
CO5	Develop privacy policies, frameworks, and strategies for organizations. [L6]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	2	1	2	1	1	2	1`
CO2	2	3	2	2	3	1	2	2	-	1	-
CO3	2	1	2	3	2	2	2	1	1	1	-
CO4	2	1	2	3	2	2	3	2	2	1	1
CO5	2	2	2	3	2	1	3	2	2	2	2

COs /PSOs	PSO1	PSO2	PSO3
CO1	3	2	2
CO2	2	2	2
CO3	2	2	2
CO4	2	2	2
CO5	3	2	3

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
					✔							

COURSE CODE:	COURSE TITLE:	Ty/Lb/ ETL/IE	L	T / S. Lr	P/ R	C
EBML24E15	PRIVACY ENGINEERING	Ty	3	0/0	0/0	3

Unit-1: The Privacy Engineering Ecosystem **9 HRS**

Introduction to Privacy Engineering - Key Stakeholders in Privacy Engineering –- Types of Privacy Risks – Data breaches, unauthorized access, surveillance risks - Privacy Challenges in the Digital Age - Historical Evolution of Privacy Laws and Regulations - Case Studies on Privacy Failures and Breaches.

Unit-2: Understanding Privacy Processes **9 HRS**

Data Collection and Privacy - Privacy Impact Assessments (PIAs) - Privacy Threat Modeling - Privacy by Design (PbD) Framework - Privacy in Software Development Lifecycle (SDLC) - Best Practices in Data Retention and Deletion.

Unit-3: Privacy Engineering and Organizational Growth **9 HRS**

Aligning Privacy Strategies with Business Objectives - Privacy as a Competitive Advantage - Implementing a Privacy-First Culture - Privacy Risk Management Frameworks - Privacy-Enhancing Technologies (PETs) - Case Studies on Privacy-Driven Business Success.

Unit-4: Privacy-Preserving Techniques and Technologies **9 HRS**

Data Anonymization and Pseudonymization - Differential Privacy - Privacy-Preserving Machine Learning - Cryptographic Methods for Privacy - Privacy in Cloud Computing - Emerging Privacy Technologies.

Unit-5: Regulatory Compliance and Ethical Considerations **9 HRS**

Overview of Global Privacy Regulations - Privacy Compliance Strategies - Ethical Issues in Data Privacy - Privacy Policies and Compliance Frameworks - Enforcement and Penalties for Non-Compliance - Future of Privacy Regulations.

Total Hours: 45

Text Books:

1. Cybellium TM**,** *Introduction to Privacy Engineering: A Comprehensive Guide*, Kindle ed., 2024.

Reference Books:

1.M. M. Carvalho and K. Al Khatib, *Privacy Engineering: A Dataflow and Ontological Approach*, 1st ed. Springer, 2021.
2.A. Cavoukian, *Privacy and Data Protection by Design – Building Effective Regulation*, 1st ed. Springer, 2019.

PROGRAM ELECTIVE – IV
SYLLABUS

COURSE CODE	COURSE NAME	SYMBOLIC ARTIFICIAL INTELLIGENCE	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E16	**Prerequisite: Fundamentals of Artificial Intelligence**		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to
Understand the Foundations of Symbolic AI
Apply Knowledge Representation Techniques
Perform Logical Reasoning and Problem Solving
Develop Rule-Based and Expert Systems
Explore Advanced Applications and Hybrid AI

COURSEOUTCOMES(Cos): Students will be able to

CO1	Explain the historical evolution, the oretical foundations, and key principles of symbolic AI[L1]
CO2	Implement various knowledge representation methods, such as semantic networks, frames, andontologies. [L4]
CO3	Utilize predicate logic, resolution, and unification algorithms for automate dreasoning. [L2]
CO4	Design and implement expert systems forreal- world applications. [L4]
CO5	Explore Advanced Applications and Hybrid AI[L3]

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	2	3	2	2	1	1	1	1	2	2	
CO2	3	3	3	2	3	2	1	1	1	2	2	
CO3	3	3	3	3	2	2	1	1	1	3	2	
CO4	3	3	3	3	3	2	2	1	2	3	2	
CO5	3	3	3	2	3	3	2	1	2	3	3	

COs/PSOs	PSO1	PSO2	PSO3	
CO1	3	2	2	
CO2	3	3	3	
CO3	3	3	2	
CO4	3	3	3	
CO5	3	3	3	

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	SYMBOLIC ARTIFICIAL INTELLIGENCE	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E16	**Prerequisite: Fundamentals of Artificial Intelligence**		Ty	3	0/0	0/0	3

Unit I INTRODUCTION TO SYMBOLICAI **9 Hrs**

Introduction to Symbolic AI- Historical Evolution. The oretical Foundations-First Order Logic, Search and Problem-Solving Methodology, Propositional Logic. Symbolic Manipulation and Representation: Process of Symbolic Manipulation, Symbol Structuring, Rule Application, Techniques of Symbol Representation, Ontology, Forward and Backward Chaining. Applications and Use Cases-Automated Reasoning, Natural Language Processing, Strengths and Limitations.

Unit II KNOWLEDGE REPRESENTATION **9 Hrs**

Knowledge Representation – Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Horn Clauses and Logic Programming, Knowledge Representation using Frame – Description Logic, Web Ontology Language, Taxonomies and Inheritance. Advanced Knowledge Representation Techniques – Conceptual Dependency Theory, Script Sculpture, CycTheory.

Unit III LOGICAL REASONING AND INTERFACE **9 Hrs**

Propositions and Predicates-Production Systems, Propositional Logic, Predicate Logic, Limitations of Propositional Logic, Tautologies, Predicate Logic. Automated Theory Proving (ATP) – Function, Search Problem, Limitations, Applications of ATP in Symbolic AI, Approaches toATP.Resolution and Unification Algorithms –Unification for Resolution, Applying the Unification Algorithm, Implementing Resolution with Unification, Benefits of unification. Constraint Satisfaction Problems (CSP) – Components, Types of Constraint Satisfaction Problems, Representation of CSP, CSP Algorithms, Applications of CSP in AI.

Unit IV EXPERT SYSTEMS & RULE BASED REASONING **9 Hrs**

Rule-Based Systems and Inference Engines –Inference Engine Function, Applications, Working of Rule Based Systems, Limitations. Expert Systems – Components, Reasoning Strategies, Types of Expert Systems in AI, Applications, Case Study. Symbolic AI in Natural Language Processing (NLP).

Unit V ADVANCEDTOPICSANDAPPLICATIONS **9 Hrs**

Planning in AI: STRIPS, Hierarchical Planning, Hybrid AI: Combining Symbolic and Neural AI Symbolic AI in Robotics and Cognitive Systems, Future Trends in Symbolic AI.

Total Hours : 45

Text book:

1.BikramPratimBhuyan, AmarRamdane-Cherif, ThipendraP. Singh, RaviTomar (2024),
2. Neuro-Symbolic Artificial Intelligence, ISBN:9789819781713

References:

1.FouadSabry (2023), Symbolic Artificial Intelligence: Fundamentals and Applications, BN ID:2940167603424

COURSE CODE: EBML24E17	COURSE NAME: PROMPT ENGINEERING	Ty/Lb/ETL /IE	L	T/S. Lr	P/R	C
	Prerequisite: Large Language Models	TY	3	0/0	0/0	3

L: LectureT: Tutorial S.Lr: Supervised LearningP: Project R: Research C: CreditsTy/Lb/ETL: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The student should be made to**:**

1. Understand the basics of prompting, including prompt structure and styles, and recognize common pitfalls of Large Language Models (LLMs).
2. Apply effective prompting techniques to accomplish daily tasks such as summary generation, proofreading, and language translation.
3. Gain knowledge of OpenAI models, their definitions, types, and the specific needs.

COURSE OUTCOMES(COs): Students will be able to

CO1	Craft effective and context-rich prompts for various applicationsand how to communicate with AI models.
CO2	Do how to train models to generate high-quality content.
CO3	Fine tune LLMs for structured output and knowledge retrieval. Specify writing styles, acting roles, format requirements and task descriptions for LLMs.
CO4	Apply best practices in prompt engineering across different use cases.
CO5	Incorporate legal, security, and privacy considerations in your prompts.

Mapping of Course Outcomes with Program Outcomes (POs):

COs/Pos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11
CO1	2	2	1	2	1	3	1	2	1	1	2
CO2	1	3	2	3	2	1	1	1	1	1	2
CO3	2	2	2	1	2	2	1	1	1	2	1
CO4	3	3	3	3	3	1	2	1	2	3	3
CO5	-	2	1	2	2	2	3	3	2	3	2

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	3	2	1
CO3	1	1	2
CO4	2	3	2
CO5	3	2	3

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Science	Engineerig Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME: PROMPT ENGINEERING Prerequisite: Large Language Models	Ty/Lb/ETL /IE	L	T/S. Lr	P/R	C
EBML24E17		TY	3	0/0	0/0	3

UNIT 1: **9 HRS**

Introduction: The importance of Prompt Engineering - Optimizing AI Interactions, Enhancing AI Model Training, Customization and Personalization, Navigating Ethical and Societal Implications, Interdisciplinary Innovation, Contextual Prompts, Summarization & Translation Prompts, Sentiment Analysis Prompts, Code Generation Prompts, Large Language Model-Distinguishing LLMs from Other Generative AI Models-Insights into the Transformer Architecture- language and tools that are great for Prompt engineering- Open AI Playground

UNIT 2: **9 HRS**

Prompt patterns basic types and templates-Elements of a proud pattern, Stochastic responses and prompt stability, Multi agent systems, Types of prompt patterns and their templates, Output customisation-Persona Pattern-Audience Persona pattern, Prompt Improvement-Questions refinement pattern, Interaction-Gameplay pattern, Template pattern -Input semantic, Metal language creation pattern, Recipe pattern, Alternative approaches pattern.

UNIT 3: **9 HRS**

Prompt Pattern Advanced Types and Templates-Output Customisation-Outline Expansion Pattern, Semantic Filter Pattern-Prompt Improvements, Refusal Breaker Pattern, Cognitive Verifier Pattern-Interaction, Flipped Interaction Pattern, Infinite Generation Pattern- Context Control, Context Manager Pattern-Error Identification, Reflection Pattern, Fact Check Reflection Pattern.

UNIT 4: **9 HRS**

Prompting Techniques- Uses of Prompting Techniques, Zero-Shot, One-Shot and Multi- Shot Prompting-Chain of Thought Prompting, Zero-Shot Chain of Thought Prompting, Few-Shot Chain of Thought Prompting, Self-Consistency- Knowledge Generation Prompting-Iterative prompting, directional stimulus prompting, prompt chaining, tree-of-thought prompting, -ReAct Prompting, Prompt Chaining

Unit 5: **9 HRS**

Prompt Management, security and Best Practice -Risks in AI Prompting, Injection Attacks, Data Leaks, Model Manipulation & Bias Exploits-Ethical Considerations in AI Prompting, Managing Sensitive Data in Prompts, Compliance and Regulatory Considerations, Case Studies & Practical Applications-Real-world Examples of Effective Prompt Management, Hands-on Exercises & Simulated Attacks, Implementing Secure and Effective Prompt Strategies in AI Workflows **Total Hours: 45**

Text Book:

Prompt Engineering for Generative AI: Future-Proof Inputs for Reliable Outputs", James Phoenix and Mike Taylor, First Edition (Published 2024)

Reference books:

1. **Prompt Engineering in Action**, Shivendra Srivastava and Naresh Vurukonda MEAP began December 2024 Publication in summer 2025 *(estimated)* ISBN 9781633435919
2. **"The Future of Prompt Engineering"** S. Geerthik, Dr. L. Sharmila, Mr. T.P. Anish, and Dr. R. Ramya First Edition (Published 2023)
3. **Prompt Engineering,** Ajantha Devi Vairamani and AnandNayyar, First Edition (Published 2024).

COURSE CODE EBML24E18	COURSE NAME: COMPUTER VISION	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Artificial Intelligence and Machine Learning	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial S.Lr: Supervised LearningP: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES:

The students should be made to

- To impart Computer Vision Knowledge by way of learning related Algorithms
- To Introduce the major ides, concepts, methods and techniques in Computer Vision
- To impartComputerVision Knowledge which includes fundamentals of image formation, camera imaging geometry, feature detection and matching, multiview geometry including stereo, motion estimation and tracking, and some machine learning problems such as image classification, object detection, and image segmentation

COURSE OUTCOMES(COs): Students will be able to

CO1	Understand the major concepts and techniques in computer vision and image processing [L1]
CO2	Infer known principles of human visual system [L4]
CO3	Demonstrate a thorough knowledge of Open CV [L2]
CO4	Develop real-life Computer Visions Applications [L4]
CO5	Build design of a Computer Vision System for a specific problem. [L3]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	3	3	2	1	1	1	-	1	-	2	
CO2	3	3	2	1	1	1	-	1	-	1	2	
CO3	3	3	3	1	2	1	-	-	1	-	1	
CO4	3	3	3	1	1	2	1	-	-	1	-	
CO5	3	3	3	2	2	2	-	-	1	1	-	

COs/PSOs	PSO1	PSO2	PSO3	
CO1	3	3	2	
CO2	3	3	1	
CO3	3	3	3	
CO4	3	3	2	
CO5	3	3	2	

3/2/1 Indicates Strength of Correlation ,3–High, 2-Medium, 1-Low:

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Inter Disciplinary	Skill Component	Practical/Project			
					√							

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24E18	COMPUTER VISION Prerequisite: Artificial Intelligence and Machine Learning	Ty	3	0/0	0/0	3

UNIT-I: **9 Hrs**

COMPUTER VISION – BASIC CONCEPTS AND INTRODUCTION

Digital Image Processing Introduction – Various Application Fields that use Image Processing – Fundamentals Steps in Digital Image Processing Technique – Components of anDigital Image Processing System. Applications of Computer Vision – Recent Research in Computer Vision. Introduction to Computer Vision and Basic Concepts of Image Formation: Introduction and Goals – Image Formation and Radiometry – Geometric Transformation – Geometric Camera Models – Image Reconstruction from a Series of Projections.

UNIT-II: **9 Hrs**

DIGITAL IMAGE PROCESSING CONCEPTS AND IMAGE FEATURES

Digital Image Processing Concepts: Fundamental Concepts – Image Transforms – Image Filtering – Colour Image Processing – Mathematical Morphology – Image Segmentation. Image Descriptors and Features: Texture Descriptors – Colour Features – Edge Detection – Object Boundary and Shape Representation – Interest or Cornet Point Detectors – Histogram Oriented Gradients – Scale Invariant Feature Transform.

UNIT-III: **9 Hrs**

DIGITAL IMAGE PROCESSING WITH OPEN COMPUTER VISION LIBRARY- OPENCV

Open Computer Vision Library - Introduction to OpenCV and Python: Setting up OpenCV – Image Basics in OpenCV – Handling Files and Images – Constructing Basic Shapes in OpenCV. Image Processing in OpenCV: Image Processing Techniques – Constructing and Building Histograms – Thresholding Techniques.

UNIT-IV: **9 Hrs**

OBJECT DETECTION

Different Models and types – Importance of Object Detection. The Working: Inputs and outputs – Basic Structure – Model Architecture Overview – Object Detection on the Edge. Use Cases and Applications: Video Surveillance – Self-driving Cars. Embedded Boards: Connecting Cameras to Embedded Boards – Simple algorithms for processing of Images and Streaming Videos.

UNIT-V: **9 Hrs**

COMPUTER VISION APPLICATIONS AND CASE STUDIES

Applications: Machine Learning algorithms and their Applications in Medical Image Segmentation – Motion Estimation and Object Tracking – Face and Facial Expression Recognition – Image Fusion. Case Studies: Face Detection – Object Tracing – Eye Tracking – Handwriting Recognition with HoG.

Total Hours:45

TEXT BOOKS:

3. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2023.

REFERENCE BOOKS:

1.Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer- Texts in Computer Science, , 2022.
4. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Cambridge University Press, 2022.
5. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2021
6. E. R. Davies, Computer and Machine Vision, Academic Press, 2022

COURSE CODE	COURSE NAME: SOFTWARE PROJECT MANAGEMENT	Ty/Lb / ETL/ IE	L	T/S. Lr	P/R	C
EBML24E19	Prerequisite: SOFTWARE ENGINEERING AND SYSTEM DEVELOPMENT	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial S.Lr: Supervised Learning P: Project R: Research C: Credits Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES:

The students should be made to

- To understand the fundamental principles of software project management
- To have a good knowledge of responsibilities of project manager.
- To be familiar with the different methods and techniques used for project management.

COURSE OUTCOMES (COs): Students will be able to

CO1	Apply project management concepts and techniques to an IT project. [L1]
CO2	Identify issues that could lead to IT project success or failure. [L4]
CO3	Explain project management in terms of the software development process. [L2]
CO4	Describe the responsibilities of IT project managers. [L4]
CO5	Apply project management concepts through working in a group as team leader [L3]

Mapping of Course Outcomes with Program Outcomes (POs):

COs/POs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	3	3	2	1	1	1		1		2	
CO2	3	3	2	1	1	1				1	2	
CO3	3	3	3	1	2	1			1		1	
CO4	3	3	3	1	1	2	1			1		
CO5	3	3	3	2	2	2			1	1		

COs / PSOs	PSO1	PSO2	PSO3	
CO1	3	3	2	
CO2	3	3	1	
CO3	3	3	3	
CO4	3	3	2	
CO5	3	3	2	

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	InterDisciplinary	Skill Component	Practical /Project			
					√							

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/I E	L	T/S . Lr	P/R	C
EBML24E19	SOFTWARE PROJECT MANAGEMENT Prerequisite: SOFTWARE ENGINEERING AND SYSTEM DEVELOPMENT	Ty	3	0/0	0/0	3

UNIT-1: INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9 Hrs.

Introduction to Software Project Management, Activities Covered by Software Project Management, Plans, methods and Methodologies, Categorizing Software Projects, Project Evaluation and Programme Management, Portfolio Management, Evaluation of Individual Projects, Cost-benefit Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programme Management, An Overview of Project Planning

UNIT-2: SELECTION OF APPROPRIATE PROJECT APPROACH EFFORT ESTIMATION 9 Hrs

Selection of an Appropriate Project Approach, Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure Versus Speed of Delivery, Software Effort Estimation, Problems with Over and Under -Estimates, Software Effort Estimation Techniques, Bottom -up Estimation, Top-down Approach and Parametric Models, Expert Judgement, estimating by Analogy, COCOMO Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression

Unit-3: ACTIVITY PLANNING AND RISK MANAGEMENT 9 Hrs

Activity Planning, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Risk Management, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk Identification, Risk Assessment, RiskPlanning, Boehme's Top ten Risks and Counter Measures, Resources Allocation, Nature of Resources, Identifying Resources Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost

Unit-4: MONITORING AND CONTROL 9 Hrs

Monitoring and Control, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management, Managing Contracts, Managing People in Software Environments, Understanding Behavior, Organizational behavior, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham-Hackman Job Characteristics Model, Stress Management.

Unit-5: SOFTWARE QUALITY 9 Hrs

Software Quality. Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans.

Total Hours: 45

TEXT BOOKS:

1. Hughes Bob, "Software Project Management ", McGraw-Hill., 2021.

REFERENCE BOOKS:

1.Jalote P. Software Project Management in practice, Second edition, Person Education; 2003.

2.Software Project Management: With PMI, IEEE-CS, and Agile-SCRUM by Moh'd A. Radaideh (Author), Kindle Edition,2023.

COURSE CODE	COURSE NAME	Artificial Intelligence in IOT	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E20	Prerequisite: Artificial Intelligence		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to
To refresh and stimulate students'English learning through Content Integrated Language Learning to
Have an in-depth understanding of the components of English language and its use in communication that they are competent in inter-personal and academic communication for a successful

COURSE OUTCOMES(Cos): Students will be able to

CO1	Define and explain the fundamental concepts and subfields of AI.
CO2	Identify real-world applications of AI across various industries.
CO3	Analyze the ethical, social, and economic implications of AI.
CO4	Recognize the potential of AI to drive innovation and transformation in different domains.
CO5	**----------**

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	1	1	2	--	--	--	1	2	2
CO2	3	3	3	3	3	2	2	2	2	2	2
CO3	2	2	1	2	3	2	3	3	2	2	3
CO4	2	2	1	2	3	2	2	2	2	2	2
CO5	---	--	--	--	--	---	--	--	--	-	---

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	3
CO3	3	3	3
CO4	3	3	2
CO5	--	--	--

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	Artificial Intelligence in IOT	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E20	Prerequisite: Artificial Intelligence		Ty	3	0/0	0/0	3

Unit I Foundations of IOT and AI **9 Hrs**

Introduction-Defining IOT and its Components-understanding AI, Machine Learning, Deep Learning, Data Collection and Preprocessing of IOT-Data Sources-Data Cleaning and Normalization-Feature Engineering-Edge Computing vs Cloud Computing.

Unit II AI Algorithms for IOT Applications **9 Hrs**

Supervised Algorithm for IOT- Regression Analysis- Classification-Real world Analysis- Unsupervised Algorithm for IOT-Clustering-Dimensionality Reduction-Reinforcement Learning for Algorithms-Applications.

Unit III AI Powered IOT Applications **9 Hrs**

Predictive Maintenance-Anomaly Detection–Intelligent IOT Devices-Smart Cities and Homes –AI for Urban for Residential and Urban Applications – AI Enabled Infrastructure.

Unit IV Challenges and Considerations **9 Hrs**

Privacy and Security in AI for IOT –Protecting Sensitive Data and Preventing Attacks – EthicalImplication of AI inIOT –Best Practices for Data Privacyand Accuracy – Case Studies of Ethical Implication of AI in IOT

Unit V Case Studies and Best Practices **9 Hrs**

Successful AI Powered AI Projects – Real World Examples from Various Industries – Success Factors and Challenges Faced -Guidelines for Sucessful AI Implementation- Strategies for Over Coming Common Challenges.

Total Hours: 45

Text book:

1. Artificial Intelligence for IoT Development: A Comprehensive

Guide to harnessing AI for Enhanced Connectivity and Automation. Alex J. Collins, Kindle Edition,2024

References:

1. Artificial Intelligencein IOT, FadiAl-Turjman, SpringerCham,2023
2. Artificial Intelligence for Internet of ThingsDesign Principle, Modernization, and Techniques ByN. Thillaiarasu, SumanLataTripathi, V. Dhinakaran, ByN. Thillaiarasu, SumanLataTripathi, V. Dhinakaran
3. Artificial Intelligence-based Internet of Things Systems by SouvikPal, DebashisDe, Rajkumar Buyya 2022
4. Artificial Intelligence:A Modern Approach, 4e, May2022 byRussell/Norvig (Author)

PROGRAM ELECTIVE – V
SYLLABUS

COURSE CODE	COURSE NAME: ARTIFICIAL INTELLIGENCE IN HEALTH CARE	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBML24E21	**Prerequisite: AI**	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial S. Lr: Supervised Learning P: Project R: Research C: Credits
Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Understand the Evolution of AI in Healthcare.
- Explore AI Applications in Drug Discovery & Pharmaceutical Research.
- Examine AI in Medical Imaging and Medical Devices.
- Assess Ethical, Legal, and Security Aspects of AI in Healthcare.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand AI's Role in Healthcare
CO2	Apply AI in Pharmaceutical Sciences
CO3	Analyze AI in Medical Imaging and Devices
CO4	Utilize AI for Surgery and Patient Monitoring
CO5	Address AI-Related Security, Ethical, and Legal Issues

Mapping of Course Outcomes with Program Outcomes (POs):

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	1	1	2	3	1	1	1	1	1
CO2	2	1	1	1	3	3	2	1	2	2	1
CO3	2	1	2	2	3	3	1	1	2	2	1
CO4	2	1	1	2	3	3	2	2	2	2	2
CO5	1	1	1	1	3	3	2	3	1	1	1

COs / PSOs	PSO1	PSO2	PSO3	
CO1	3	2	1	
CO2	3	3	2	
CO3	3	2	2	
CO4	3	3	2	
CO5	3	2	2	

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
					✔				

COURSE CODE	COURSE NAME ARTIFICIAL INTELLIGENCE IN HEALTHCARE	Ty/Lb / ETL /I E	L	T/S. Lr	P/R	C
EBML24E21	Prerequisite: AI	Ty	3	0/0	0/0	3

UNIT-I: THE RISE OF ARTIFICIAL INTELLIGENCE IN HEALTH CARE 9 Hrs

Current healthcare practice - Value-based treatments and healthcare services - Increasing data volumes in healthcare - Analytics of healthcare data – The new age of healthcare - Precision medicine -Medical visualization -Intelligent personal health records.

UNIT-II: ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL 9 Hrs

AI in drug discovery - Molecular modeling and databases - Computational mechanics ML methods in molecular modeling- Drug characterization using isopotential surfaces - Drug design for neuroreceptors using artificial neural networktechniques- Specific use of deep learning in drug design.

UNIT-III: ARTIFICIAL INTELLIGENCE FOR MEDICAL IMAGING AND DEVICES 9 Hrs

Introduction to medical imaging and devices- AI in radiology/medical imaging - Application of AI in medical imaging- The development of AI in medical devices - Limitations -The future frontiers of AI in medical devices.

UNIT-IV: AI ASSISTEDSURGERY AND PATIENT MONITORING 9 Hrs

Preoperative - Intraoperative – Postoperative - Introduction to remote patient monitoring - Deployingpatient monitoring - Cardiac monitoring using AI - Neural applications of AI.

UNIT-V: AI FORDIGITAL SECURITY, PRIVACY, ETHICAL AND LEGAL 9 Hrs

Introduction to digital Security and privacy concerns in healthcare AI- Artificial intelligence's risks and opportunities for data privacy - Addressing threats to health systems and data in the artificial - intelligence age - sharingchallenges in healthcare artificial intelligence - Ethical and legal challenges of artificial intelligence-driven healthcare.

Total Hours: 45

TEXT BOOKS:

1) Adam Bohr, Kaveh Memarzadeh (2020) "Artificial Intelligence in Healthcare", Academic Press Inc.

REFERENCE BOOKS:

1. William R. Hersh (2022) "Health Informatics: Practical Guide" lulu.com
2. Edward H. Shortliffe, James J. Cimino (2020) "Biomedical Informatics: Computer Applications in Health Care and Biomedicine", Academic Press Inc.
3. Tianhua Chen, Jenny Carter, Mufti Mahmud, Arjab Singh Khuman(2022) "Artificial Intelligence in Healthcare Recent Applications and Developments"Springer Singapore

Subject Code	Subject Name: AI/ML IN BUSINESS ANALYTICS	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBML24E22	**Prerequisite: AI &ML**	Ty	3	0/0	0/0	3

L: Lecture T: Tutorial SLr: Supervised Learning P: Project R: Research C: Credits
T/L/ETL: Theory / Lab / Embedded Theory and Lab

OBJECTIVES:

- Use AI and ML to analyze customer behavior and preferences, enabling the creation of personalized experiences, product recommendations, and marketing strategies that improve customer engagement and satisfaction.
- Utilize AI and ML models to predict future trends and behaviors, such as customer demand, sales forecasts, or market fluctuations, allowing businesses to make proactive, data-driven decisions.

COURSE OUTCOMES (Cos):
Students completing this course were able to

CO1	Master the Fundamentals of AI and ML Algorithms
CO2	Understand the fundamental concepts of Artificial Intelligence (AI) and Business Analytics (BA).
CO3	Discuss the Machine Learning Workflow end-to-end machine learning pipeline, including data collection, preprocessing, model training, evaluation, and deployment.
CO4	To Learn Time Series Concepts the Data Collection and Preprocessing & Exploratory Data Analysis.
CO5	To develop the AI& ML Applications in Business Solving.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	2	2	1	1	1	1	1	
CO2	2	2	2	2	1	2	1	2	2	1	
CO3	2	2	1	2	2	2	1	2	1	2	1
CO4	2	2	2	2	2	2		2	1	1	
CO5	2	3	3	2	2	2	2	2	2	1	1

COs/PSOs	PSO1	PSO2	PSO3
CO1	2	3	2
CO2	2	2	2
CO3	3	3	2
CO4	2	2	2
CO5	3	2	3

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills
					√				

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/SLr	P/R	C
EBML24E22	**AI/ML IN BUSINESS ANALYTICS Prerequisite: AI &ML**	Ty	3	0/0	0/0	**3**

UNIT-I: BUSINESS ANALYTICS AND INTELLIGENCE 9 HRS

Business Analytics and Intelligence – Business Analytics Technology Framework – Procedure Model: Business Analytics Model for AI – Machine Learning – Types of Machine learning and Algorithms – Classification, Dependence and Association, Clustering, Reference Predication, Optimization.

UNIT-II: AI AND BUSINESS ANALYTICS PLATFORM 9 HRS

Basic concepts and Software Frameworks – Data Management- Data Analysis and Programming Languages- AI Frameworks-Business analytics and machine learning as a service- Amazon AWS- Google Cloud Platform- ML Services from Google-IBM Watson- Microsoft Azure- SAP Business Technology Platform.

UNIT-III: MACHINE LEARNING PROCESS 9 HRS

Data Visualization- Basic Charts – Dimension Reduction – evaluating Predictive Performance – Performance Predictive Performance – Multiple Linear Regression – KNN – Naive Bayes – Neural Sets – Classification and Regression Trees.

UNIT-IV: FORECASTING TIMESERIES 9 HRS

Introduction of Forecasting - Handling Time Series – Regressive based Forecasting – Smoothing Methods – Data Analytics – Social Network Analytics – Text Mining – responsible Data science – Documentation Tools.

UNIT-V: CASE STUDY IN AI AND ML BUSINESS ANALYSIS 9 HRS

Case Studying – Analysing customer sentiment in Real time with streaming analysis – case study market segmentation and automation in retaining with Neural Network – Cases in Charles Book club – German credit, Taxi cancellation – Segmenting consumer of bath soap. – CatLog cross selling – loan approval.

Total Hours: 45

TEXT BOOK:

1.” Artificial Intelligence for Business Analytics: Algorithms”, Platforms and Application Scenarios. Felix Weber, Springer 1st edition. 2023.
2.” Machine Learning for Business Analytics” By Galitshmueli, peterc. BruceKuberR.Deokar, NitinR.patel2nd Edition. Wiley-Blackwell 2nd edition. 2023.

REFERENCE BOOKS:

1. EthemAlpaydin, 2020 “Introduction to Machine Learning” 3r.d Edition PHI.
2. SnilaGollapudi, 2022 “Practical Machine Learning” PACKT.
3. Stuart R. Peter N. (2020) Artificial Intelligence A Modern Approach, Prentice Hall.
4. Elaine R. Kevin K. (2020) Artificial Intelligence Tata McGraw Hill.

COURSE CODE	COURSE NAME	AI IN HUMAN COMPUTER INTERACTION	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E23	Prerequisite: Artificial Intelligent		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

Understand the fundamentals of AI and its role in HCI.
Analyze user experience (UX)principles in AI-enhanced systems.
Develop intelligent interfaces that adapt based on user behavior and feed back.
Implement AI techniques in real-world HCI applications.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Explain the capabilities of both humans and computers from the view point of human Information processing.
CO2	Describe typical human–computer interaction (HCI)models, styles, and various historic HCI paradigms.
CO3	ApplyaninteractivedesignprocessanduniversaldesignprinciplestodesigningHCI systems.
CO4	Describe and use HCI design principles, standards and guidelines.
CO5	Analyze and identify user models, user support, socio-organizational issues, and Stake holder requirements of HCI systems.

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
CO1	3	3	3	2	1	1	1	-	1	0	2	
CO2	3	3	2	1	1	1	0	0	0	1	2	
CO3	3	3	3	1	2	1	0	0	1	0	1	
CO4	3	3	3	1	1	2	1	0	0	1	1	
CO5	3	3	3	2	2	2	0	0	1	1	0	

COs/PSOs	PSO1	PSO2	PSO3	
CO1	3	3	2	
CO2	3	2	1	
CO3	3	3	3	
CO4	3	3	2	
CO5	3	3	2	

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	BasicScience	Engineering Science	HumanitiesandsocialScience	ProgramCore	Program elective	OpenElective	Inter Disciplinary	Skill Component	Practical/ Project
	-	-	-		-√	-	-	-	-

COURSE CODE	COURSE NAME	AI IN HUMAN COMPUTER INTERACTION	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E23	Prerequisite: Artificial Intelligent		Ty	3	0/0	0/0	3

Unit I FOUNDATIONS OF HCI **9 Hrs**

The Human: I/O channels–Memory– Reasoning and problem solving; The computer: Devices–Memory–processing and networks; Interaction: Models–frame works– Ergonomics–styles–elements–interactivity-Paradigms

Unit II DESIGN & SOFTWARE PROCESS **9 Hrs**

Interactive Design basics–process–scenarios–navigation–screen design–Iteration and prototyping. HCI in Software process–software life-cycle–usability engineering– Prototyping in practice–design-rationale. Design rules– principles, standards, guidelines, rules. Evaluation Techniques–UniversalDesign

Unit III MODELS & THE ORIES **9 Hrs**

Cognitive models–Socio-Organizational issues and stakeholder requirements– Communication and collaboration models- Hypertext, Multimedia-and WWW.

Unit IV MOBILE HCI **9 Hrs**

Mobile Ecosystem: Platforms, Application frameworks Types of Mobile Applications: Widgets, Applications, Games-Mobile Information Architecture, Mobile2.0, Mobile Design: Elements of Mobile Design, Tools.

UnitV WEB INTERFACE DESIGN **9 Hrs**

Designing Web Interfaces, Drag & Drop, Direct Selection, Contextual Tools, Over lays, In lays and Virtual Pages, Process Flow.Case Studies.

Total Hours: 45

Textbook:

1. AlanDix, JanetFinlay, GregoryAbowd, RussellBeale, “HumanComputerInteraction”,3rd Edition, Pearson Education,2004.

References:

1. Human Computer, Interaction DanR.Olsan,Cengage,2010

COURSE CODE	COURSE NAME	AI IN QUANTUM COMPUTING	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E24	**Prerequisite: Physics, Funtamental of AI, Digital Electronics, Microprocessor**		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To develop an understanding of fundamental computing models, quantum principles, and key concepts that differentiate classical and quantum systems.
To comprehend the architecture of quantum computing and apply Quantum Fourier Transforms toproblem-solving.
To explore fundamental and advanced quantum algorithms and implement them for various applications.
To study quantum machine learning techniques and integrate the minto hybrid computational solutions.
To develop problem-solving skills using unique quantum search strategies in AI.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Understand quantum needs and develop design solutions using quantum circuits
CO2	Illustrate the impact of quantum architectures on security, privacy, and societal challenges
CO3	Apply quantum and probabilistic algorithms to optimize computational processes and solve complex problems efficiently
CO4	Analyze quantum-enhanced machine learning techniques and quantum cryptographic Protocols to evaluate their impact on computational efficiency and secure communication.
CO5	Evaluate the effectiveness of quantum-based search, Production system, and AI application Indiverse field

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	1	-	2	-	-	-	1	-	-
CO2	-	3	-	-	-	1	2	-	-	-	-
CO3	1	-	-	3	2	-	-	-	-	-	1
CO4	2	-	-	1	-	3	-	-	-	-	-
CO5	2	-	3	-	1	-	-	-	-	-	-

COs/PSOs	PSO1	PSO2	PSO3
CO1	1	1	2
CO2	2	3	1
CO3	1	2	3
CO4	2	1	3
CO5	1	3	2

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	AI IN QUANTUM COMPUTING	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E24	Prerequisite: Physics, Funtamental of AI, Digital Electronics, Microprocessor		Ty	3	0/0	0/0	3

Unit I Introduction to Quantum Computing **9 Hrs**

Basics of Classical vs. Quantum Computing-Quantum Bits (Qubits) and Bloch Sphere Representation-Superposition, and Entanglement-Heisenberg's Uncertainty Principle- quantum teleportation-wave particle-Double split Experiment-single split Experiment

Unit II Quantum Architecture **9 Hrs**

Single-Qubit Gates -Hadamard, Pauli, Phase Gates-Multi-Qubit Gates -CNOT, Toffoli, Swap-Quantum Registers and Quantum Memory-quantum error correction-Bit-Flip and Phase-Flip Codes

Unit III Quantum AI & The Future of AI **9 Hrs**

Quantum machine learining-Qml code example using Qiskit or Tensorflow Quantum- Advanced Quantum Machine Learning with MNIST dataset- Quantum Neural network – Implementing a Quantum Neural Network with tensor flow-AJupyternotbookversion Of the Quantum Neural network-Quantum natural language processing

Unit IV Building Quantum AI modeland Algorithm **9 Hrs**

Building Quantum AI model-Quantum Computing Platform-Quantum AI programming language- Shor's Algorithm-Quantum Fourier Transform-Grover's Algorithm

Unit V Quantum AI application and challenges in future trends **9 Hrs**

Current limitation of Quantum AI-Ethical consideration in Quantum AI-privacy concern and Quantun AI Surveillance-Accountability Trasparency in Quantum AI-Quantum AI Application-Drug Discovery& Healthcare-Finance & optimazation-cypersecurity& Quantum Cryptography

Total Hours: 45

Text book:

1.HusnAra, "Quantum computing in AI", Kindle Edition,2025

References:

1.Rieffel, E. G.&PolakW. H., "Quantum computing: Agentle introduction", MITPress, 2011 Farhi, E., Goldstone, J. & Gutmann, S., "A quantum approximate optimization algorithm", arXivpreprintarXiv:1411.4028, 2014

2. Farhi, E., Goldstone, J.&Gutmann, S., "Aquantumapproximateoptimizationalgorithm", arXiv preprint arXiv:1411.4028, 2014

3. Russell, S.&Norvig, P., "Artificial Intelligence: A modern approach",4thedition, Pearson Education,2021

COURSE CODE	COURSE NAME	ARTIFICIAL INTELIGENCE IN CYBERSECURITY	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E25	**Prerequisite: AI basics and Machine learning, Cyber security basics**		Ty	3	0/0	0/0	3

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

1. To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
2. To plan, implement, and monitor cyber security mechanisms through AI to ensure the protection of information technology assets
3. Analyze and resolve security issues innetworks and computer systems using AI and Machine Learning models.
4. Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.
5. Infuse AI capabilities when buildings mart defensive mechanisms.

COURSE OUTCOMES(Cos): Students will be able to

CO1	Follow a structured model in Security Systems using the concepts in AI and ML
CO2	Plan, implement and audit security in a networked, multi-plat form and crossplat form environment
CO3	Protect data and respond to threats through various AI and Machine learning models
CO4	Ability to apply AI and machine learning models in cyber security issues.
CO5	Detect attack methodology and combat hackers from intrusion or others us piceous attempts At connection to gain unauthorized access to a computer and its resources

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	3	1	-	-	-	1	1	2	1
CO2	-	3	2	2	1	-	1	-	1	-	-
CO3	3	1	3	2	3	2	1	1	1	1	2
CO4	1	3	2	3	3	2	-	-	-	-	-
CO5	3	1	2	3	3	2	3	2	-	-	1

COs/PSOs	PSO1	PSO2	PSO3
CO1	3	2	3
CO2	2	3	3
CO3	3	3	2
CO4	2	3	3
CO5	3	2	3

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	Basic Science	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical/ Project
					√				

COURSE CODE	COURSE NAME	ARTIFICIAL INTELEGENCE INCYBERSECURITY	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBML24E25	Prerequisite: AI basics and Machine learning, Cyber security basics		Ty	3	0/0	0/0	3

Unit I Introduction to AI for cyber security **9 Hhrs**

Applying AI in cyber security, The evolution from expert systems to data mining and AI, Thedifferent forms of automated learning, Characteristics of algorithmtraining and optimization, AI in CyberSecurity and security frame work: Artificial intelligence in cybersecurity, Challenges and promises, Security threats of Artificial Intelligence.

Unit II Role of AI in Cyber Security **9 Hrs**

Arsenal Classification, Regression, Dimensionality reduction, Clustering, Speech recognition, Video anomaly detection, Natural language processing, Large-scale image processing, social media analysis.

Unit III Detecting cybersecurity threats with AI **9 Hrs**

Detect spam with perceptrons, Image spam detection with support vector machines (SVMs), Phishing detection with logistic regression and decision trees, spam detection with Naive Bayes, spam detection adopting NLP.

Unit IV Protecting Sensitive information and Assets **9 Hrs**

Authentication Abuse Prevention, Account reputation scoring, User authentication with key stroke recognition, Biometric authentication with facial recognition

Unit V Fraud Prevention with AI solutions **9 Hrs**

AI and ML algorithms for fraud detection, how bagging and boosting techniques can improve an algorithm effectiveness, Model stealing and watermarking, Network traffic Analysis, Malware Analysis

T\otal Hours : 45

Textbook:

1. Alessandro Parisi, Hands-On Artificial Intelligence for Cybersecurity: Implement smart AI systems for preventing cyberattacks and detecting threats and network anomalies, Packt Publication (2019).

References:

1. Tsai, JeffreyJP, and S. YuPhilip, eds. Machine learning in cybertrust: security, privacy, and reliability. Springer Science & Business Media, 2009.
2. Dr. NilakshiJain, Artificial Intelligence, AsperAICTE: Making a System Intelligent, Wiley Publication (2019).
3. Artificial Intelligence and Data Mining Approaches in Security Frameworks Editor(s): Neeraj Bhargava, Ritu Bhargava, Pramod Singh Rathore, Rashmi Agrawal, 2021.

FOREIGN LANGUAGE – I SYLLABUS

(II SEMESTER)

Note: Students should be given sufficient practice to acquire skillfor reading, writing and speaking words, adjectives, tenses and sentences of all types.

Subject Code	Subject Name: FRENCH-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I01	**Prerequisite: Nil**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES(Cos):
Students completing this course were able to

CO1	Learn to write numbers, alphabets, regular and irregular verbs
CO2	Practice preposition and articles.
CO3	Comprehend model verbs and speak in future
CO4	Familiarize colours, place and create phrases
CO5	Master conjugation and speaking the language

Mapping of Course Outcome with Program Outcome (POs):

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	BasicSciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: FRENCH-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I01	**Prerequisite: Nil**	IE	1	0/0	1/0	1

UNIT-I: **6 Periods**

Les Salutations, Les Nombres (1-20), Les alphabets, Les PronomsSujets, Les Langues, Les Nationalités, Les Verbes: Parler, être, avoir,

UNIT-II: **6 Periods**

Les Nombres (21-100), L'heure, Les Pays, Les propositions des pays, Les articles définis, Les articles indéfinis, Les Verbes: s'appeler, Aimer et habiter.

UNIT-III: **6 Periods**

Les verbes: Aller, Venir, Les Articles Contractés, La Négation, Les Adjectifs Démonstratifs, FuturPrôche, Model Verbs, AdjectifsPossessifs.

UNIT-IV: **6 Periods**

Les articles partitifs, LesVerbes: Faire, Jouer. LaFamille, LesCouleurs, Leslieuxdans laville,

UNIT-V: **6 Periods**

LesVerbes: Lire, Écrire, Regarder, Voir, Écouter, Entendre

Total periods:30

TEXT BOOKS:

1. ÉchoA1, J. Girardet&J. Pecheur, CLE International,2nd Edition
2. SaisonA1, JeanGiraudoux, Goyalpublisher,1st Edition

REFERENCE BOOKS:

1. Alter EgoA1, VeroniqueMKizirian& AnnieBerthet, Hachette,1st Edition
2. CosmopoliteA1, NathalieHirschsprung &TonyTricot, Goyal Publisher1st edition

EBFL23I01 FRENCH–I- Details in English for contents of each unit

Unit-I:
Introduction to French words through the greetings and simple vocabulary like numbers, languages, nationalities are taught. Concept of conjugation of regular and irregular verbs.

Unit-II:
More focus on grammatical elements like prepositions and articles. Various scenarios inclusive of the parts of speech learnt are to be discussed and practiced. Complete vocabulary for numbers and there for e practice show to say time.

Unit-III:
Comprehension of demonstrative and possessive adjectives and the concept to f model verbs is introduced. Simple understanding of 'Futurprôche' which enables the student to speak in future tense. Building negative sentences with different verbs.

Unit-IV:
Learning vocabulary in most common categories like colours, places etc. and picking up on creating French phrases of right construct. Focus primarily on speaking and writing.

Unit-V:
Learning essential verbs of regular actions in French that are more frequent in our daily life and thus mastering conjugations and speaking from the to pofourheads. More familiarity towards language is there for e attained.

Total periods:30

TEXT BOOKS:
1. ÉchoA1, J. Girardet&J. Pecheur, CLEInternational,2nd Edition
2. SaisonA1, JeanGiraudoux, Goyalpublisher,1st Edition

REFERENCE BOOKS:
1. Alter EgoA1, Veronique MKizirian &Annie Berthet, Hachette,1st Edition
2. CosmopoliteA1, Nathalie Hirschsprung &Tony Tricot, Goyal Publisher1st edition

Subject Code	Subject Name: GERMAN-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I02	**Prerequisite: Nil**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES(Cos):
Students completing this course were able to

CO1	Learn to write numbers, alphabets, regular and irregular verbs
CO2	Practice preposition and articles.
CO3	Comprehend model verbs and speak in future
CO4	Familiarize colours, place and create phrases
CO5	Master conjugation and speaking the language

Mapping of Course Outcome with Program Outcome (POs):

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/ Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: GERMAN-I	Ty/ Lb / ETL/IE	L	T/SLr	P/R	C
EBFL23I02	**Prerequisite: Nil**	IE	1	0/0	1/0	1

UNIT-I: **6 Periods**

Das Alphabet, DieZahlen von ein -hundert, Begrüßung, Verabschiedung, SichVortstellen, W – Fragen. Grammatik: - W- Frage, Aussagasatz, Verban und Personnelpronomen

UNIT-II: **6 Periods**

Genders in Deutsch, Die Personel pronomen, Definite/Indefinite / Negative Articles, Jem and enkennen lernen, Landkarte. Grammatik – bestimmter Artikel: der, die, das, Nomen: Singular und Plural, aussagesatz, negationartikel

UNIT-III: **5 Periods**

Possessiv pronomen, Verb konjugation, Ja/Nein Fragen, Satzstruktur Grammatik: Regelmäßige, Unregelmäßige, hilfsverben- Sein/haben, Unbestimmer Artikel

UNIT-IV: **5 Periods**

Wie spätistes, Tageszeiten, Die, Wochentage, Die Monate, das Wetter, Die Himmelsrichtungen, Diefamilie, Klassenzimmer – Substantive, Countries and Languages, Negation, Like /Dislike. Grammatik: Akkusative, Verbenmit accusative, wörterorden und lernen, artikelimdativ, Präpositionmit +Dativ

UNIT-V: **5 Periods**

Nominativ, Dativ, Accusative, Einkaufen, ImFlugzueg, Imkaufhaus, Jobsuche. Grammatik: Personal pronomenim Akkusativmich, dich, model verb anmüssen, können, wollen

Total periods: 30

TEXT BOOKS & REFERENCE BOOKS:

1. Shritte International, Daniela Niebisch, FrazSppeeht, AngelaPude
2. NetzwerkA1, Stefanie Dengler, PaulRusch, HelenSchmitz, TanjaSieber

EBFL23I02 GERMAN–I-Details in English for contents of each unit

Unit-I:

Alphabet-Numbers from 1 to100-Greetings and Goodbye-Self Introduction
W questions-Grammar

Unit-II:

Genders in German-Personal Pronoun (For Conjugation)-Definite/Indefinite/Negative Articles- Ask about others -(MAP and Possition of Land) – Grammar

Unit-III:

Possessive Pronoun-Verb Conjugation-Yes/No Question-Sentence making in German–Grammar

Unit-IV:

What time is it? Times of the day-The Week days and Months)- The Weather, Directions-The Family - Substantive, Countries and Languages - Class Room – Substantive Countries and its Languages - Negation, Like /Dislike – Grammar

Unit-V:

Accusative - Shopping - In Flight - In departmental store - Job search
Grammar

Total periods:30

TEXT BOOKS & REFERENCE BOOKS:

1. Shritte International, Daniela Niebisch, FrazSppeeht, AngelaPude
2. Netzwerk A1, Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber

Subject Code	Subject Name: JAPANESE-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I03	Prerequisite: Nil	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES(Cos):
Students completing this course were able to

CO1	Learn to write Roumajiscript, Able to selfintroduce themselves, Will have knowledge Of Hiragana and also able to speak about their Family membres. Count upto100.
CO2	Able to countuptp 10, 000, Will have knowledge of Katakana Alphabets, Will be able Identify the body parts. Able to understand pronouns.
CO3	AnalyzeVaried particles and also the existential verbs. Will be able to countusing the conceptofCounters.
CO4	Will get knowledge of the two different types of adjectives both Iending and Naending Adjectives and frame different sentences with these two.
CO5	Master the conjugation of 24 forms of the verbs.

Mapping of Course Outcome with Program Outcome (POs):

Cos/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: JAPANESE–I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I03	**Prerequisite: Nil**	IE	1	0/0	1/0	1

UNIT-I: **5 Periods**
Introduction, Roumaji, Hiragana, Self Introduction, Family relations, Numbers (1-100)

UNIT-II: **5 Periods**
Numbers (101-1000), Numbers (1001-10,000), Katakana, Body parts, and Pronouns

UNIT-III: **8 Periods**
Introduction to particles (wa, mo, ka, desu, ni, ga, de), Imasu, Arimasu, Couters

UNIT-IV: **5 Periods**
Adjective i-ending, and Na Ending

UNIT-V: **7 Periods**
Verbs (24 forms)

Total periods:30

TEXT BOOKS:
1. Genki, EriBnno, YokaIkeda, YutakaOhno, ChikkaoShinogawa, KyokoTokoshiki, The Japanese Publishing Company

REFERENCE BOOKS:
1. MinnaNoNihongo,3 ACorporation, Goyal Publication

Subject Code	Subject Name: ARABIC-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I04	Prerequisite: Nil	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To learn, speak, write and do basic conversation in Arabic Language

COURSEOUTCOMES(Cos):
Students completing this course were able to

CO1	Learn alphabets, vowels and gender
CO2	Ask questions, numerbs and counting
CO3	Converse in a public place in Arabic
CO4	Identify and speak a boutfood, weather etc
CO5	Analyze verbs, tenses, singular and plural

Mapping of Course Outcome with Program Outcome (POs):

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/ Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: ARABIC-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I04	**Prerequisite: Nil**	IE	1	0/0	1/0	1

UNIT-I: **6 periods**

Alphabets–Greetings–question words–meeting people first time–introduction–introducing family members

Grammar–Present simple, long and short vowels, masculine and feminine distinctions

UNIT-II: **6 periods**

Asking questions-describing city, capitalcities, town scountries–numbers and counting–how many–how much – buying and selling

Grammar–negation to present form–moon letters–genitive case–spelling rules for Hamza, Idafa

UNIT-III: **6 periods**

Eating and drinking–talking about ethnic food sanf favourite cuisines–communicative phrases at public places – questions with what

Grammar–Group words–past tense–plural and joint cases

UNIT-IV: **6 periods**

Describing weather – trips and adventures -camping – school trips

Grammar – future tense, verbs in plural

UNIT-V: **6 periods**

Time and everyday routine – making comparison – days of week – comparing past and present

Grammar – Negative statements – pronouns - superlatives

Total periods:30

TEXT BOOKS & REFERENCE BOOKS:

1. The Essentials Arabic., Rafiel Imad Faynan., Arabic Edition Publisher
2. Gateway to Arabic, Imran.H. Alawiye, Paper back publisher

Subject Code	Subject Name: CHINESE-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I05	**Prerequisite: Nil**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/EmbeddedTheoryandLab/InternalEvaluation

OBJECTIVES:

This is a beginning level course in Chinese Mandarin, including introduction of phonetics and daily expressions. It is aimed at students with no prior knowledge of Chinese.

COURSE OUTCOMES(Cos):
Students completing this course were able to

CO1	Basic understanding of Chinese Mandarin
CO2	Do conversations of daily living such as greetings
CO3	Acquaint exchange personal information, making aninquiry on time, etc
CO4	Acquire listening, speaking, and reading skills in Chinese Mandarin.
CO5	Use the language in real life scenarios and for every day conversational communications.

Mapping of Course Outcome with Program Outcome (POs):

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1IndicatesStrengthOfCorrelation,3–High,2-Medium,1-Low:

Category	BasicSciences	Engg.Science	Humanities &Social Science	Program Core	Program Elective	Open Elective	Practical/ Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: CHINESE-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I05	**Prerequisite: Nil**	IE	1	0/0	1/0	1

UNIT-I: **6 periods**

Introduction of Chinese language Initials and finals, read initials: b, p, m, f, d, t, n, l, g, k, h Beable toread finals: a, o, e, i, u, ü, ai, ei, ao, ou, an, en, ang, new words combined with tones greet people using: How do you do?

UNIT-II: **6 periods**

Initials: j, q, x, z, c, s, zhi, chi, shi, rfinals: eng, ong, ia, iao, ie, -iu, ian, in, iang, ing, iong, ernewwords combined with tones greet people using: How are you?

UNIT-III: **6 periods**

Finals:ua, uo, uai, ui, uan, uen, un, uang, ueng, üe, üan, ün

New words combined with tones o count numbers count date, month and year greet people using: Are you busywith your work?

UNIT-IV: **6 periods**

New words questions with "吗" questions with interrogative pronouns adjectival predicate acquaintance using: May I know your name?

UNIT-V: **6 periods**

Sentences with a verbal predicate attributive genitive use the "是" sentence acquaintance using: Let me introduce.

Total periods:30

TEXT BOOKS & REFERENCE BOOKS:

1. The first 100 Chinese Characters, Laurence Mathews, Tuttle Publishers
2. Learning Mandarin Chinese, Version2, YiRen, Tuttle Publishers

Subject Code	Subject Name: RUSSIAN-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I06	**Prerequisite: Nil**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

This is a beginning level course in Chinese Mandarin, including introduction of phonetics and Daily expressions. It is aimed at students with no prior knowledge of Chinese.

COURSE OUTCOMES(Cos):
Students completing this course were able to

CO1	Acquaint Phonetics–Alphabets and sounds
CO2	Use different types of nouns and self introduce.
CO3	Identify general vocabulary and greetin the language
CO4	Identify and apply sounds with different stems and word construction
CO5	Construct and speak sentences in the language

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation,3–High,2-Medium,1-Low:

Category	BasicSciences	Engg.Science	Humanities & Social Science	ProgramCore	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: RUSSIAN-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I06	**Prerequisite: Nil**	IE	1	0/0	1/0	1

UNIT-I: **6 periods**

Phonetics: Alphabets and Sounds, Voice and vowels, Voice and Voiceless– Consonants- Self Intro, Self Name in Russian Language

UNIT-II: **6 periods**

Etho construction, Shtho Etho, Kmo Etho-Animates and Inanimatenouns

UNIT-III: **6 periods**

General Vocabulary, Answering the objects with Etho on interrogatives ShthoEtho and Kmotho? -Greetings of the Day on various timings

UNIT-IV: **6 periods**

Alphabets, sounds with Hard stems - Gender of Nouns, Demonstrative Pronouns using vocabulary and simple word constructions -General words on regular us: Excuse me, May I Come in, excuse me, Thank you andseeyou again

UNIT-V: **6 periods**

Revision of Vocabulary, New Words, Greetings and other Day to day usage of sentences

Total periods:30

TEXT BOOKS & REFERENCE BOOKS:

1. Russian for begineers, Gateway Guides, Kindle Edition
2. Learn to speak & Write Russian, VasudaBhaskar, ChatterSinghPublishers.

Subject Code	Subject Name: SPANISH-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I07	**Prerequisite: Nil**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, S. Lr: Supervised Learning, P: Problem/Practical
R: Research, Ty/Lb/ETL/IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES(Cos):
Students completing this course were able to

CO1	Learn to write numbers, alphabets, regular and irregular verbs
CO2	Practice preposition and articles.
CO3	Comprehend model verbs and speak in future
CO4	Familiarize colours, place and create phrases
CO5	Master conjugation and speaking the language

Mapping of Course Outcome with Program Outcome (POs):

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation ,3–High,2-Medium,1-Low:

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	OpenElective	Practical/Project	Internships/Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: SPANISH-I	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I07	**Prerequisite: Nil**	IE	1	0/0	1/0	1

UNIT-I: **5 periods**

LosSaludosy Despedidas, LosAlfabetos, LosNumeros (1-20), Sonidosy Letras:H, C/Qa, G/J, B/V, C/Z, R, R/rr, Ch, G/Gu, Ll, N, Aficiones.

UNIT-II: **5 periods**

LosNumeros (21-100), Pronombres Personales: Yo, Tu, El, Eyya, Nosotros, Vosotros, Ustedes, Usted.Serverbos: Soy, Eres, Es, Somos, Sois, Son. Nacionalidad, Profesiones.

UNIT-III: **5 periods**

Singulary Plural, Conversion de Singulara Plural. Masculinoy Feminino, conversion demasculino a feminino. Tener verbos: Tengo, Tienes, Tiene, Tenemos, Teneis, Tienen. Llevarverbos.

UNIT-IV: **10 periods**

Vocabulariode Colores, Casa, Bebidas, Ciudad, Clima, Colegio, Comida, Medios, Saludos, Verduras.Articules definidos, Articules indefinidos.

UNIT-V: **5 periods**

Estarverbos: Estoy, Estas, Esta, Estamos, Estais, Estan. Reflex iveverbos: Me, Te, Se, Nos, Os, Se. Cuantificadores, Preguntar y Responder.

Total periods:30

TEXT BOOK:

1. Aulainternacional1, Jaimecorpas&EvaGarcia, diffusion, Nuevaedicion

REFERENCE BOOK:

1. Grammatic adeusoA1-B2, LuisAragones, RamonPalencia, smeLe, Nuevaedicion

EBFL23I07 SPANISH–I-Details in English for contents of each unit

UNIT-I:

Introduction of Spanish words through the greetings, goodbyes, hobbies. Simple vocabulary like numbers (1 – 20) andalphabets. Pronunciation ofH, C/Qa, G/J, B/V, C/Z, R, R/rr, Ch, G/Gu, Ll, Naretaught.

UNIT-II:

Focusing on grammatical elements like subject pronouns and irregular verbs. Complete vocabulary for numbers, Nationality and professions. Therefore, practice how to say time, phone number, Nationality and profession.

UNIT-III:

Singular and plural forms of noun and conversion from singular to plural. Identifying the nouns as masculine or feminine. Conversion of nouns from masculine to feminine. Focusing on Tener and Llevar verbs.

UNIT–IV:

Learning vocabulary in most common categories like colours, Houses, Drinks, City, Climate, Foods. Learningboth definite and indefinite articles. More focusing on reading, writing and speaking.

UNIT–V:

More focusing on grammatical elements like Estar verbs and Reflexive verbs usually used in everyday life, Quantification like much, more. More familiarity towards language is therefore attained.

Total periods:30

TEXTBOOK:

1. Aulainternacional 1, Jaimecorpas&EvaGarcia, diffusion, Nuevaedicion

REFERENCEBOOK:

1. Grammatic adeusoA1-B2, LuisAragones, RamonPalencia, smeLe, Nuevaedicion

FOREIGN LANGUAGE – II
SYLLABUS

(V SEMESTER)

Note: Students should be given sufficient practice to acquire skill for reading, writing and speaking words, adjectives, tenses and sentences of all types.

Subject Code	Subject Name: FRENCH - II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I08	Prerequisite: French I	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES (Cos):
Students completing this course were able to

CO1	Identify future verbs, pronouns etc
CO2	Express hobbies such as sports etc in the language
CO3	Analyze active and passive voices
CO4	Use articles and express views on travel, food etc in the language
CO5	Use French grammar and construct sentences to speak in daily routines

Mapping of Course Outcome with Program Outcome (POs):

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/ Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: FRENCH - II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I08	**Prerequisite: French I**	IE	1	0/0	1/0	1

UNIT-I: **5 Periods**

FuturProche, PronomsToniques, Les Verbes: Devoir, Pouvoir, Vouloir, Savoir. Le Vocabulaire: Les Loisirs (Sports, Spectacles et Activités)

UNIT-II: **10 Periods**

Passé Composé, Le voix Active et Passive, Comparaison, Adjectifs Possessifs.

UNIT-III: **5 Periods**

Les Articles Partitifs, Emploi des Articles, Le Vocabulaire: Les Voyages, Les Transports, La nourriture, La Forme possessive: <<à + pronom>>

UNIT-IV: **5 Periods**

Le ConjugaisonPronominale, L'Impératifs, L'expression de la quantité, Les activitésquotidiennes, Les achats, L'argent

UNIT-V: **5 Periods**

Prépositions et adverbes des lieux, L'Imparfait, Les moments de la vie, La famille, Emploi dupassé composé et de l'imparfait, L'enchainement des idées (alors, donc, mais)

Total periods: 30

TEXT BOOKS:

1. Écho A1, J. Girardet & J. Pecheur, CLE International, 2nd Edition
2. Saison A1, Jean Giraudoux, Goyal publisher, 1st Edition

REFERENCE BOOKS:

1. Alter Ego A1, Veronique M Kizirian & Annie Berthet, Hachette, 1st Edition
2. Cosmopolite A1, Nathalie Hirschsprung & Tony Tricot, Goyal Publisher 1st edition

EBFL23I08 FRENCH – II - Details in English for contents of each unit

Unit-1: 6 periods

Near Future, Tonique Pronouns, Verbs: Devoir, Pouvoir, Vouloir, Savoir.Vocabulary: Hobbies (Sports, Shows and Activities)

Unit-2: 6 periods

Simple Past, Active voice and Passive Voice, Comparatives, Possessive pronouns.

Unit-3: 6 periods

Les Articles Partitifs, Usage of Articles, Vocabulary: Travel, Transport, Food, Possessiveforms with: <<à + pronom>>

Unit-4: 6 periods

Conjugation of Reflexive Verbs, Imperatives, Expressions of quantities, Daily Life Activities,Buying and Selling, Money

Unit-5: 6 periods

Prepositions and adverbs of places, Past continuous, Moments of Life, The Family, Usage ofSimple past and past continuous, Linking words in sentences (alors, donc, mais)

Total periods: 30

TEXT BOOKS:

1.Écho A1, J. Girardet & J. Pecheur, CLE International, 2nd Edition

2.Saison A1, Jean Giraudoux, Goyal publisher, 1st Edition

REFERENCE BOOKS:

1.Alter Ego A1, Veronique M Kizirian & Annie Berthet, Hachette, 1st Edition

2.Cosmopolite A1, Nathalie Hirschsprung & Tony Tricot, Goyal Publisher 1st edition

Subject Code	Subject Name: GERMAN - II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I09	**Prerequisite: German I**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES (Cos):
Students completing this course were able to

CO1	Speak about countries, shopping etc in Russian language
CO2	Write and tell numbers uoto million
CO3	Express views about daily routine, weather etc
CO4	Identify verbs, clauses, noun as indicator of time
CO5	Analyze grammar and put into use in daily life

Mapping of Course Outcome with Program Outcome (POs):

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: GERMAN – II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I09	**Prerequisite: German I**	IE	1	0/0	1/0	1

UNIT-1: **6 periods**

Deutschprachige Länder, Adresse, Meine Familie, Labensmittel einkaufen, Meine Wohnung, Das Zimmer ist nicht groß, Zahlen von hunder zu eine million.

UNIT-2: **6 periods**

Die Pronomen und Verben, Verben Stamm endung mit "s", "ss", "ß", "x" or "z", Genders und Artikel, Mein Tag, Tageszeiten, Montag bis Freitag. Geschlecht der Substantive, Wohenende, Freizeit und Hobbys, wetter – Grammatik: Akkusativ: bestimmter Artikel, Akkusativ: unbestimmter Artikel

UNIT-3: **6 periods**

Kinder und Schule, Akkusativ unbestimmter Artikel, Tagesablauf, Stress im Büro, Am Computer, Termine vereinbaren, Die Jahreszeiten und das Wetter, Tagesablauf, Stress im Büro, Am Computer

UNIT-4: **6 periods**

Verben Grundlagen der Zeitform, Die Gruppe der Substantive, Die Verneinung, Hauptsätze und Nebensätze. Verben mit Dativ und Akkusativ; Konjunktiv II; Substantive als Indikatoren der Zeit, Kasus

UNIT-5: **6 periods**

Grammatik: Präpositionen der Zeit, Satzverknüpfungen: Konjunktionen, Die Gruppe der Substantive, Indikatoren für den Raum, AdjektiveVisuelle Klasse für das Hören

Total periods: 30

TEXT BOOKS & REFERENCE BOOKS:

1.Shritte International, Daniela Niebisch, Fraz Sppeeht, Angela Pude, Daniela Niebisch, Fraz Speeht, Angale Pude
2.Netzwerk A1, Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber

Subject Code	Subject Name: GERMAN II – CONTENTS IN ENGLISH	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I09	**Prerequisite: German I**	IE	1	0/0	1/0	1

Unit-I: **6 periods**

German-speaking countries, Address, my family, shopping for groceries, my apartment, the room is not big, Numbers from a hundred to a million

Unit-II: **6 periods**

The pronouns and verbs, verbs ending with "s", "ss", "ß", "x" or "z", genders and articles, my day, times of day, Monday to Friday. Gender of nouns, Wohenende, Freizeit und Hobbys, wetter - Grammar: Akkusativ: definite article, Akkusativ: indefinite article

Unit-III: **6 periods**

Children and school, Daily routine, Stress in the office, At the computer, Making appointments, The seasons and the weather, Daily routine, Stress in the office, At the computer

Unit-IV: **6 periods**

Verb tense basics, The group of nouns, The negation, Main clauses and subordinate clauses Verbs with dative and accusative; subjunctive II; nouns as indicators of time, case

Unit-V: **6 periods**

Grammar: Prepositions of time, Sentence linking: Conjunctions, The group of nouns, Indicators of space, Adjectives - Visual class for hearing

Total periods: 30

TEXT BOOKS & REFERENCE BOOKS:

1.Shritte International, Daniela Niebisch, Fraz Sppeeht, Angela Pude, Daniela Niebisch, Fraz Speeht, Angale Pude
2.Netzwerk A1, Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber

Subject Code	Subject Name: Japanese - II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I10	Prerequisite: Japanese - I	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES (Cos):
Students completing this course were able to

CO1	Develop the skill of crafting sentences employing adjectives with both 'i' and 'na' endings, alongside formulating suggestion plans using various verb forms.
CO2	To Enhance the ability to express daily actions using diverse verb forms, construct sentences or engage in dialogue to request objects from others, and formulate sentences to prohibit certain actions.
CO3	Master the utilization of continuous tense to describe daily habits, while also comprehending the usage of conjunctions with different verb forms.
CO4	Gaining familiarity with informal speech patterns, employing the dictionary form of verbs for informal communication, and grasping the concept of expressing desires for objects and actions involving those objects.
CO5	Crafting sentences in the past tense to narrate past daily activities and acquiring knowledge about conjunctions such as 'because'.

Mapping of Course Outcome with Program Outcome (POs):

Cos/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: Japanese– II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I10	**Prerequisite: Japanese - I**	IE	1	0/0	1/0	1

UNIT-I: **5 Periods**
Grammer paterns Te form, Te moiidesu, Te ha ikemasen, te kara, mashouka.

UNIT-II: **3 Periods**
Te imasu, Continuoustense, te kudasai

UNIT-III: **7 Periods**
Te iku, Counting people

UNIT-IV: **8 Periods**
Informal speech (dictionaryform)Using the particle « ga » Verbs forms like and dislike, negative form te kudasai

UNIT-V: **7 Periods**
Past tense, - karaform (because), qualifying nouns with verbs and adjectives.

Total periods: 30

TEXT BOOKS:
1.Genki, Eri Bnno, Yoka Ikeda, Yutaka Ohno, Chikkao Shinogawa, Kyoko Tokoshiki, The Japanese Publishing Company

REFERENCE BOOKS:
1.Minna No Nihongo, 3A Corporation, Goyal Publication

Subject Code	Subject Name: ARABIC- II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I11	**Prerequisite**: **Arabic - I**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES (Cos):
Students completing this course were able to

CO1	Express views about school, college, subjects, future plans etc.
CO2	Converse with Friends and family, identify colurs and clothes
CO3	Explain daily routine and works in Arabic language
CO4	Write resume and apply for jobs
CO5	Talk about various activities like sports etc

Mapping of Course Outcome with Program Outcome (POs):

Cos/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name: ARABIC - II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I11	**Prerequisite**: **Arabic I**	IE	1	0/0	1/0	1

Unit-I: **6 Periods**

Familiarization about school and at university – talking about subjects – future plans –months of the year

Grammar – Past negation and future negation

Unit-II: **6 Periods**

Talking about yourself – about nationality and friends – describing character – talking about childhood experiences

Grammar – review of pronoun and past tense

Unit-III: **6 Periods**

Work and routine – talking about work - typical day of work – writing resume and applyingjobs

Grammar – Review of present form

Unit-IV: **6 Periods**

Talking about sports and outside activities – free time activitiesGrammar – verbal nouns and participles

Unit-V: **6 Periods**

Clothes and colour- writing reviews and opinions – food and cookingGrammar – Doubled verbs and negation

Total periods: 30

Text books & Reference books:

1. The Essentials Arabic., Rafiel Imad Faynan., Arabic Edition Publisher Gateway to Arabic, Imran.H. Alawiye, Paperback publisher

Subject Code	Subject Name: CHINESE - II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I12	**Prerequisite: Chinese I**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

This is a beginning level course in Chinese Mandarin, including introduction of phonetics and daily expressions. It is aimed at students with no prior knowledge of Chinese.

COURSE OUTCOMES (Cos):
Students completing this course were able to

CO1	basic understanding of Chinese Mandarin
CO2	basic conversations of daily living such as greetings
CO3	making an acquaintance, exchanging personal information, making an inquiry on time, etc
CO4	gain training in listening, speaking, and reading skills in Chinese Mandarin.
CO5	real life scenarios and can be used for everyday conversational communications.

Mapping of Course Outcome with Program Outcome (POs):

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

COURSE CODE	COURSE NAME: CHINESE- II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I12	Prerequisite: Chinese I	IE	1	0/0	1/0	1

UNIT-I: **5 periods**

Sounds and tones Daily conversations Difficult point Role Play using conversations learnt

UNIT-II: **5 periods**

New words Be able to use sentences with a nominal predict Be able to use the question tag"…, 好吗？" Be able to make an inquiry about days of a week When is your birthday? Difficult point Ask about the year, the month, the day and the days of a week

UNIT-III: **5 periods**

Be able to read new words Be able to use the "有" sentence Be able to use prepositionalconstructions Be able to make an inquiry about and introduce family members. 8.3 Key point(s) and difficult point(s) Key point learn to use the "有" sentence difficultpoint Introduce family members

UNIT-IV: **10 periods**

Be able to read new words Be able to use time as subjects, predicates, and attributives. Beable to make an inquiry about time.

UNIT-V: **5 periods**

Key point Conversations Difficult point Express ideas using conversations learned

Total periods: 30

Text books and Reference Books:

1.The first 100 Chinese Characters, Laurence Mathews, Tuttle PublishersLearning Mandarin Chinese, Version2, Yi Ren, Tuttle Publishers

COURSE CODE	COURSE NAME: RUSSIAN - II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I13	**Prerequisite: Russian-I**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

This is a beginning level course in Chinese Mandarin, including introduction of phonetics and daily expressions. It is aimed at students with no prior knowledge of Chinese.

COURSE OUTCOMES (Cos):

Students completing this course were able to

CO1	basic understanding of Chinese Mandarin
CO2	basic conversations of daily living such as greetings
CO3	making an acquaintance, exchanging personal information, making an inquiry on time, etc
CO4	gain training in listening, speaking, and reading skills in Chinese Mandarin.
CO5	real life scenarios and can be used for everyday conversational communications.

Mapping of Course Outcome with Program Outcome (POs):

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										**3**		**2**
CO2										**3**		**2**
CO3										**3**		**2**
CO4										**3**		**2**
CO5										**3**		**2**

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

COURSE CODE	COURSE NAME: RUSSIAN- II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I13	**Prerequisite**: **Russian-I**	IE	1	0/0	1/0	1

UNIT-I: **5 periods**

Singular & Plurals, Formation of Plural nouns with a hard stem - Personal and Possesive Pronouns and exercises- Russian lessons reading and writing

UNIT-II: **5 periods**

Construction of sentences with KTHO ECTH, Negation with HIYATH & HE - Pointing of objects ON/VA/ Thooth & Thaam - Names of the Months, Numerical, Names of the Week in Russian Language

UNIT-III: **5 periods**

Verb Conjugations: Chitaat, Slushat, Igraath - Interrogatives Shtho, Gde, KudA, Kogda, Kakaya, Chei, and answering the questions - Verbs with particles and conjugations

UNIT-IV: **10 periods**

General concept of Verb aspects - Tenses, Verbs of motions - short form of Adjectives

UNIT-V: **5 periods**

Accusative3 case with explanation and examples - Instumental case with explanation and examples - Complex sentences - Direct and indirect sentences - Reading Texts and translation and Viva - Reading and writing practice and Revision

Total periods: 30

Text books & Reference Books:

1. Russian for begineers, Gateway Guides, Kindle Edition
2. Learn to speak & Write Russian, Vasuda Bhaskar, Chatter Singh Publishers.

COURSE CODE	COURSE NAME: SPANISH - II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I14	**Prerequisite: Spanish I**	IE	1	0/0	1/0	1

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES (Cos):
Students completing this course were able to

CO1	Learn to write numbers, alphabets, regular and irregular verbs
CO2	Practice preposition and articles.
CO3	Comprehend model verbs and speak in future
CO4	Familiarize colours, place and create phrases
CO5	Master conjugation and speaking the language

Mapping of Course Outcome with Program Outcome (POs):

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		2
CO2										3		2
CO3										3		2
CO4										3		2
CO5										3		2

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low:

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

COURSE CODE	COURSE NAME: SPANISH - II	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I14	**Prerequisite**: **Spanish I**	IE	1	0/0	1/0	1

UNIDAD – I: **5 HRS**

El Abecedario – a saludar y a despedidas – Las nacionalidades – las profesiones y sobre las palabras - LosNumeros (1- 100) – La presentacion – hablar – dias de la semana y meses.

UNIDAD – II: **5 HRS**

Sobretemporadasen Espanol yotrapaises – pronombrepersonales – articulesdefinidos, indefinidos y sus usos – verbosregulares – Hablar, comer, vivir con oraciones de ejemplo – conversion de singular a plural-Identificando masculine o femenino.

UNIDAD – III: **5 HRS**

Verbos irregular's mas frequentes – Ser, Estar, Ir, Tener, Decir, Poder, Querer, Pedir, Conocer con oraciones de ejemplo – Los Numerous 1000 y vocabulario – Numeros – Telefonicos – direcciones cardinals y medios de transporte – preguntarpordirecciones y describer un camino.

UNIDAD – IV: **6 HRS**

El Vocabulariode Animales – Avion – Cuerpo – Familia – Deporte – Geografia – Aficiones – Colores, Casa – Bebidas – Ciudad – Clima – Colegio –Ropa -– Saludos – Tiempo – Transporte.

UNIDAD – V: **4 HRS**

A hablar de Clima – Explicar: Un/Una/Unas/Unos y oraciones – Explicar: Mucho/Muha/Muchos/Muchasy oraciones – preguntas: Que/ Cual/ Cuales/ Cuantos/ Cuantas/Donde- Escuchar y escribir

Total periods: 30

TEXT BOOK:

1. Aula internacional 1, Jaime corpas & Eva Garcia, diffusion, Nueva edicion

REFERENCE BOOK:

1. Grammatica de uso A1-B2, Luis Aragones, Ramon Palencia, smeLe, Nueva edicion

EBFL23I14	SPANISH – II - Details in English for contents of each unit

UNIT-1:

The Alphabets – Greetings and goodbyes related words – nationality in Spanish and other languages – profession and related vocabulary – speaking about days of the week andmonths.

UNIT-2:

Speaking about seasons in Spanish and other languages – personal pronouns – definite and indefinite articles and their regular uses – Regular verbs in Spanish – to speak – to eat – tolive – to wear – to carry – to take with example sentences. Converting singular to plural – identifying masculine and feminine words.

UNIT-3:

Most frequent irregular verbs – to be – go – have – say – can – want – ask – know – with example sentences – the numbers up to 1000 related vocabulary – speaking about door number, age, telephone numbers – directions and transport related vocabulary – ask for directions and describing about path.

UNIT-4:

Vocabulary of animals – plane – body – family – sports – geography – hobbies – colours – House – drinks – city – climate – school - collage – cloths – greetings – weather – transportations with example sentences.

UNIT-5:

Talk about seasons – different forms of one and example sentences- Many, More, much with example sentences – what, which, where, how, how many why questions and answers – listening and writing related sentences.

Total periods: 30

TEXT BOOK:

1. Aula internacional 1, Jaime corpas & Eva Garcia, diffusion, Nueva edicion

REFERENCE BOOK:

1. Grammatica de uso A1-B2, Luis Aragones, Ra