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

BACHELOR OF TECHNOLOGY
COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE)

REGULATION 2022

DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

Department of CSE

Vision:

To become a Premier Institution of Excellence in Computer Science and Engineering that would develop self sustaining and globallycompetent Computer Science and Information Technology Professionals.

Mission:

M1: Enable studentswith the best of Technologies and Knowledge emerging in the domain of Computer Science and Engineering.

M2: Equip the department laboratories with the power of in-demand Technologies 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 comprehend problems across Inter Disciplinary Domains and offer innovative solution using ICT.

B. Tech-CSE (AI) Program Educational Objectives (PEO)

The Graduate will be able to

PEO1: Establish a career in Computer Science and Engineering in Industry, Government, Academia and work collaboratively with Peers

PEO2: Successfully pursue Higher Studies in the field of Engineering, Science, Technology and Management and/or take up Research

PEO3: Promote Design, Research and implementation of Products and Services in the field of Computer Science & Engineering through strong Communication, Leadership and Entrepreneurial Skills

PEO4: Engage himself in a Professional, Ethical and Responsible manner to the Profession, Industry, Nation and the Society

PEO5: Undertake the development of Innovative Systems and Solutions using Hardware and Software integration

PEO6: Contribute to the Nation's ICT Mission through software development and ICT related activities of the government

B. Tech-CSE (AI) Program Specific Outcomes (PSO)

PSO's describe what students are expected to know or be able to do by the time of graduation from the program.

PSO1: To apply the emerging technology based on Artificial Intelligence and to create new prospects in the working environment and build an arena for advanced learning and research oriented activities.

PSO2: To demonstrate expertise in Artificial intelligence for addressing the real time problem in organizations and research firms.

PSO3: To employ the theoretical and practical learning of Artificial Intelligence for analysis, Design and development of computing system in multi-disciplinary field.

PSO4: To enrich the practical knowledge in AI through the exposure from real time application by developing socially relevant projects to resolve the current issues and thereby provide reliable and appreciable solutions.

B. Tech-CSE (AI) Program Outcomes (PO)

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

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

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

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

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

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

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

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

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

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

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

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

Mapping of Mission with PEO

Mission/ PEO	PEO1	PEO2	PEO3	PEO4	PEO5	PEO6
M1	3	3	3	2	3	**2**
M2	3	3	3	1	2	2
M3	3	2	3	3	2	1
M4	2	2	3	3	3	1
M5	2	2	3	2	3	3

Mapping of PEO with PO

PEO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	3	3	3	2	2	3	1	2	3	2	1	3
PEO2	3	3	3	2	2	3	2	2	1	3	1	3
PEO3	3	3	3	3	2	2	2	2	3	3	3	2
PEO4	3	3	3	1	2	3	3	3	3	2	1	1
PEO5	3	3	3	3	3	2	2	2	3	2	3	3
PEO6	3	2	2	1	2	3	3	3	3	3	3	2

Mapping of PEO with PSO

PEO/PSO	PSO1	PSO2	PSO3	PSO4
PEO1	3	2	2	1
PEO2	2	3	1	2
PEO3	2	2	3	3
PEO4	2	1	2	2
PEO5	1	2	2	1
PEO6	2	1	2	2

Strength of Correlation 3-High 2-Medium 1-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
EBPH22ET1	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
EBMA22003	MATHEMATICS – II	Ty	3	1/0	0/0	4	BS
EBPH22001	SOLID STATE PHYSICS	Ty	3	0/0	0/0	3	BS
EBCH22002	TECHNICAL CHEMISTRY	Ty	3	0/0	0/0	3	BS
EBME22001	ENGINEERING GRAPHICS	Ty	2	0/0	2/0	3	ES
EBCS22001	FUNDAMENTALS OF COMPUTER ENGINEERING	Ty	3	0/0	0/0	3	PC
EBCC22I02	COMMUNICATIVE ENGLISH LAB	IE	1	0/0	1/0	1	HS
EBCS22ET2	PYTHON PROGRAMMING	ETL	1	0/0	2/0	2	PC
EBCC22I03	ENVIRONMENTAL SCIENCE (Audit Course)	IE	1	0/0	1/0	0	HS
Credits Sub Total						19	

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TOTAL CREDITS: 37

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

III SEMESTER								
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**	**Category**
1	EBMA22006	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	EBAI22001	FOUNDATIONS OF AI	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	EBAI22ET1	JAVA PROGRAMMING FUNDAMENTALS	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	EBMA22011	STATISTICS FOR COMPUTER ENGINEERS	Ty	3	1/0	0/0	4	BS
2	EBCS22004	DESIGN AND ANALYSIS OF ALGORITHMS	Ty	3	0/0	0/0	3	PC
3	EBCS22005	OPERATING SYSTEM	Ty	3	0/0	0/0	3	PC
4	EBEC22ID2	MICROPROCESSOR AND MICROCONTROLLERS	Ty	3	0/0	0/0	3	ID
5	EBCC22I04/ EBCC22I05	THE INDIAN CONSTITUTION/ THE INDIAN TRADITIONAL KNOWLEDGE(Audit Course)	IE	2	0/0	0/0	0	ID
PRACTICALS*								
1	EBEC22IL2	MICROPROCESSOR AND MICROCONTROLLERS LAB	Lb	0	0/0	3/0	1	ID
2	EBCS22L03	DESIGN AND ANALYSIS OF ALGORITHMS LAB	Lb	0	0/0	3/0	1	PC
3	EBCS22L04	OPERATING SYSTEM LAB	Lb	0	0/0	3/0	1	PC
4	EBAI22ET2	INTRODUCTION TO BIG DATA ANLAYTICS	ETL	2	0/0	2/0	3	PC
5	EBCS22I01	TECHNICAL SKILL I	IE	0	0/0	2/0	1	SC
6	EBCC22I06	SOFT SKILL I -Employability Skills	IE	0	0/0	2/0	1	SC
						Credits Sub Total	21	

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	EBCS22006	COMPUTER ORGANIZATION AND ARCHITECTURE	Ty	3	1/0	0/0	4	PC
2	EBCS22007	COMPUTER NETWORKS	Ty	3	0/0	0/0	3	PC
3	EBCS22008	PRINCIPLES OF COMPILER DESIGN	Ty	3	0/0	0/0	3	PC
4	EBAI22EXX	PROGRAM ELECTIVE I	Ty	3	0/0	0/0	3	PE
5	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
PRACTICALS*								
1	EBCS22L05	NETWORK PROGRAMMING LAB	Lb	0	0/0	3/0	1	PC
2	EBCS22L06	COMPILER DESIGN LAB	Lb	0	0/0	3/0	1	PC
3	EBAI22ET3	INTELLIGENT MULTI AGENT & EXPERT SYSTEM	ETL	2	0/0	2/0	3	PC
4	EBCS22I02	TECHNICAL SKILL II	IE	0	0/0	2/0	1	SC
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	EBCS22009	OBJECT ORIENTED SOFTWARE ENGINEERING	Ty	3	0/0	0/0	3	PC
2	EBCS22010	WEB DESIGN USING PHP& MYSQL	Ty	3	0/0	0/0	3	PC
3	EBAI22002	NATURAL LANGUAGE PROCESSING CONCEPTS & PRINCIPLES	Ty	3	0/0	0/0	3	PC
4	EBAI22EXX	PROGRAM ELECTIVE II	Ty	3	0/0	0/0	3	PE
5	EBXX22OEX	OPEN ELECTIVE II	Ty	3	0/0	0/0	3	ID
PRACTICALS*								
1	EBCS22L07	OBJECT ORIENTED SOFTWARE ENGINEERING LAB	Lb	0	0/0	3/0	1	PC
2	EBCS22L08	WEB DESIGN USING PHP& MYSQL 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	EBCS22I03	TECHNICAL SKILL III	IE	0	0/0	2/0	1	SC
5	EBAI22I01	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	EBAI22003	DEEP LEARNING PRINCIPLES	Ty	3	1/0	0/0	4	PC
2	EBAI22EXX	PROGRAM ELECTIVE III	Ty	3	0/0	0/0	3	PE
3	EBCS22013	CONNECTED BUSINESS	Ty	3	0/0	0/0	3	PC
4	EBCS22014	CLOUD COMPUTING	Ty	3	1/0	0/0	4	PC
5	EBAI22004	ESSENTIALS OF MACHINE LEARNING	Ty	3	0/0	0/0	3	PC
PRACTICALS*								
1	EBXX22OLX	OPEN LAB	Lb	0	0/0	3/0	1	ID
2	EBCS22L09	DATA ANALYTICS LAB USING MACHINE LEARNING ALGORITHMS	Lb	0	0/0	3/0	1	PC
3	EBCS22L10	CLOUD COMPUTING LAB	Lb	0	0/0	3/0	1	PC
4	EBAI22I02	PROJECT PHASE – 1	IE	0	0/0	3/3	2	P
5	EBFL22IXX	FOREIGN LANGUAGE	IE	1	0/0	1/0	1	HS
Credits Sub Total							23	

VIII SEMESTER								
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**	**Category**
1	EBCC22ID2	PRINCIPLES OF MANAGEMENT AND BEHAVIORAL SCIENCE	Ty	3	0/0	0/0	3	ID
2	EBAI22EXX	PROGRAM ELECTIVE IV	Ty	3	0/0	0/0	3	PE
3	EBAI22EXX	PROGRAM ELECTIVE V	Ty	3	0/0	0/0	3	PE
PRACTICALS*								
1	EBAI22L01	PROJECT PHASE – II	Lb	0	0/0	12/12	8	P
Credits Sub Total:17								

TOTAL CREDITS:166

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 : 19

Semester : 3 : 25

Semester : 4 : 21

Semester : 5 : 23

Semester : 6 : 20

Semester : 7 : 23

Semester : 8 : 17

Total Credits : 166

PROGRAM ELECTIVE -I : GENERAL APPLICATIONS							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/ IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBAI22E01	BUSINESS INTELLIGENCE	Ty	3	0/0	0/0	3
2	EBAI22E02	COGNITIVE SYSTEM	Ty	3	0/0	0/0	3
3	EBAI22E03	INTELLIGENT ROBOTICS & DRONE TECHNOLOGY	Ty	3	0/0	0/0	3
4	EBAI22E04	REINFORCEMENT LEARNING	Ty	3	0/0	0/0	3

PROGRAM ELECTIVE -II : HEALTH CARE							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/ Lb/ ETL/ IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBAI22E05	MACHINE INTELLIGENCE FOR MEDICAL IMAGE ANALYSIS	Ty	3	0/0	0/0	3
2	EBAI22E06	BIO-INFORMATICS	Ty	3	0/0	0/0	3
3	EBAI22E07	INTELLIGENT EMBEDDED SYSTEMS	Ty	3	0/0	0/0	3
4	EBAI22E08	COMPUTER VISION IN HEALTHCARE	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

PROGRAM ELECTIVE –III : IOT							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBAI22E09	IOT FOR SMART APPLICATIONS	Ty	3	0/0	0/0	3
2	EBAI22E10	PREDICTIVE ANALYSIS AND IOT	Ty	3	0/0	0/0	3
3	EBAI22E11	SMART PRODUCT DEVELOPMENT	Ty	3	0/0	0/0	3
4	EBAI22E12	EVENT PROCESSING & CORRELATION SYSTEM	Ty	3	0/0	0/0	3

PROGRAM ELECTIVE –IV : CYBER SECURITY

S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/ Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBAI22E13	AI FOR CYBER SECURITY	TY	3	0/0	0/0	3
2	EBAI22E14	CYBER THREAT INTELLIGENCE	TY	3	0/0	0/0	3
3	EBAI22E15	AI IN BLOCK CHAIN	TY	3	0/0	0/0	3
4	EBAI22E16	MALWARE ANALYSIS IN DATA SCIENCE	TY	3	0/0	0/0	3

PROGRAM ELECTIVE – V : SPEECH & VISION

S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/ Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBAI22E17	HUMAN MACHINE INTERACTION	TY	3	0/0	0/0	3
2	EBAI22E18	SPEECH PROCESSING	TY	3	0/0	0/0	3
3	EBAI22E19	GAME PROGRAMMING	TY	3	0/0	0/0	3
4	EBAI22E20	IMAGE & VIDEO PROCESSING	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

OPEN ELECTIVES OFFERED FOR CSE(AI)STUDENTS

ELECTRONICS AND COMMUNICATION ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/SLr	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/SLr	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/SLr	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	TechnicalEntrepreneurship	Ty	3	0/0	0/0	3

OPEN LAB OFFERED FOR CSE(AI)STUDENTS

ELECTRONICS AND COMMUNICATION ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/E TL/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 OPEN ELECTIVES OFFERED BY CSE DEPARTMENT TO OTHER DEPARTMENT STUDENTS

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
1	EBCS22OE1	Cyber security & Forensics	Ty	3	0/0	0/0	3
2	EBCS22OE2	Artificial Intelligence	Ty	3	0/0	0/0	3
3	EBCS22OE3	Data Base Concepts	Ty	3	0/0	0/0	3
4	EBCS22OE4	Software Engineering	Ty	3	0/0	0/0	3

LIST OF OPEN LABS OFFERED BY CSE DEPARTMENT TO OTHER DEPARTMENT STUDENTS

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S Lr	P/R	C
1	EBCS22OL1	Artificial Intelligence Lab	Lb	0	0/0	3/0	1
2	EBCS22OL2	PHP/My SQL Programming Lab	Lb	0	0/0	3/0	1
3	EBCS22OL3	Database Lab	Lb	0	0/0	3/0	1

LIST OF FOREIGN LANGUAGES

S.NO	COURSE CODE	COURSE NAME
1	EBFL22I01	FRENCH
2	EBFL22I02	GERMAN
3	EBFL22I03	JAPANESE
4	EBFL22I04	ARABIC
5	EBFL22I05	CHINESE
6	EBFL22I06	RUSSIAN
7	EBFL22I07	SPANISH

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	6	22	28	16.87	330
	LAB	-	-			-
	ETL	2	6			120
Engineering Science	THEORY	1	3	6	3.61	60
	LAB	0	0			-
	ETL	1	3			60
Humanities and social science	THEORY	3	3	4	2.41	90
	LAB	1	1			30
	ETL	0	0			-
Program core	THEORY	15	49	72	43.37	735
	LAB	10	10			450
	ETL	5	13			270
Program Electives	THEORY	5	15	15	9.03	225
	LAB					
	ETL					
Open Elective	THEORY	2	6	7	4.22	90
	LAB	1	1			45
Inter Disciplinary	THEORY	6	13	18	10.84	240
	LAB	3	3			120
	ETL	1	2			45
Skill Component		6	6	6	3.61	195
Project		2	10	10	6.02	90
If others any						
	TOTAL	70	166	166	100	3195

Revision/Modification done in syllabus content

S.No	Course (Subject) Code	Course (Subject) Name	Concept/ topic if any, removed in current curriculum	Concept/topic added in the new curriculum	% of Revision/ Modification done
1	EBCS22002	Data Structures	Unit 2 Tree.	Unit 1-Polynomial Representation and Addition, Generalized Linked List. Unit-2-Dequeue and Priority Queue. Complete Binary Tree, Algebraic Expressions, Extended Binary Trees Unit-3 B- Trees, Heaps. Insertion Sort, Collision Resolution Strategies	30
2	EBCS22003	Data Base Management System	Unit 3-QBE - level – Basic Structure – various operations – relational database design – problems in the relational database design	2^{nd} ,3^{rd} and 5^{th} unit is updated with new topics	50
3	EBCS22004	Design and analysis of Algorithms		Unit 5 Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound	
4	EBCS22005	Operating Systems		Unit 4-I/O Systems is added 5^{th} unit is completely updated	25
5	EBCS22007	Computer Networks		Unit 2 Mobile telephone system –IPV4 and Basics	10
6	EBCS22008	Principles of Compiler Design	Unit 1 &2 System Software concepts	System Software And Principles Of Compiler Design IS Changed AS Principles Of Compiler Design	90
7	EBCS22013	Connected Business		Internet of Things Subject is updated in 2^{nd}, 3^{rd},4^{th} units and renamed	80

8	EBAI22002	Natural Language Processing Concepts & Principles	Two topics removed from Unit 5.	Applications of NLP	20
9	EBAI22003	Deep Learning Principles	One topic removed from Unit 1	Unit 5 completely changed	50
10	EBAI22004	Essentials of Machine Learning		Subject name changed. All units title changed. New topic added in Unit 1 and 3. Unit 5 completely changed.	70
11	EBCS22L01	Data Structures Lab	Unit 3- Dequeue, circular-operations	Unit-5 ADT based programs are added Included (bubble sort, insertion sort, shell sort programs	30
12	EBCS22LO2	DBMS Lab		New Experiments for SQL Queries added	40
13	EBCS22L03	Design and analysis of Algorithms Lab	3 programs are removed	2 new programs are added	25
14	EBCS22L04	Operating Systems lab	Unit 3- Implementation of Deadlock Detection Algorithm programs are added	Unit 5-Inter-process communication between related processes using pipes.	30
15	EBCS22L05	Network Programming Lab	3 programs were removed a)Design a TCP concurrent server to echo given set of sentences using poll functions. b) Implement Concurrent Time Server application using UDP to execute the program at remote server. c)Client sends a time request to the server; server sends its system time back to the client. Client displays the result.		10
16	EBCS22L06	Compiler Design LAB		Lexical Analyzer using "C" program id removed	20
17	EBCS22L07	OOSE Lab			40

			Student Result Management System Course Registration System	Payroll processing application Hotel Management System E-Ticketing	
18	EBCS22L0 9	Data Analytics Lab using Machine Learning Algorithm	New subject		100
19	EBCS22L08	Web Technologies and web Services& PHP& MySQL Lab		Web Technology lab is combined with php and introduced as a new lab	90
20	EBAI22E01	Business Intelligence		New Subject	100
21	EBAI22E02	Cognitive System		New Subject	100
22	EBAI22E03	Intelligent Robotics & Drone Technology		New Subject	100
23	EBAI22E 04	Reinforcement Learning		New Subject	100
24	EBAI22E05	Machine Intelligence For Medical Image Analysis		New Subject	100
25	EBAI22E06	Bio-Informatics		New Subject	100
26	EBAI22E07	Intelligent Embedded Systems		New Subject	100
27	EBAI22E08	Computer Vision In Healthcare		New Subject	100
28	EBAI22E09	Iot For Smart Applications		New Subject	100
29	EBAI22E10	Predictive Analysis and IoT		New Subject	100
30	EBAI22E11	Smart Product Development		New Subject	100
31	EBAI22E12	Event Processing & Correlation System		New Subject	100
32	EBAI22E13	AIfor Cyber		New Subject	100

		Security			
33	EBAI22E14	Cyber Threat Intelligence		New Subject	100
34	EBAI22E15	AIin Block Chain		New Subject	100
35	EBAI22E16	Malware Analysis in Data Science		New Subject	100
36	EBAI22E17	Human Machine Interaction		New Subject	100
37	EBAI22E18	Speech Processing		New Subject	100
38	EBAI22E19	Game Programming		New Subject	100
39	EBAI22E20	Image & Video Processing		New Subject	100
40	EBCS22ET2	Python Programming		New Subject	100
41	EBAI22ET1	Java Programming Fundamentals		New Subject	100
42	EBAI22ET2	Introduction to Big Data Analytics	Topic Framework deleted in Unit 5.	Subject name changed. Added as ETL paper.Realtime applications added in Unit 5.	20
43	EBAI22ET3	Intelligent Multi agent and Expert system		New Subject	100

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

Sl. No	New courses	Value added courses	Life skill/ ETL	Electives	Inter Disciplinary	Focus on employability/ entrepreneurship/skill development.
1	C Proramming and MS Office Tools	Technical Skill I	Python Programming	Total number of program Electives: 20 (as given in the curriculum)	Digital Principles And System Design	Technical Skill I
2	Fundamentals of Computer Engineering	Technical Skill II	Object Oriented Programming With C++	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	User Experience Design		Digital Systems Lab	Technical Skill III
4	Web Design using php&MySQL Lab	Universal human values : Understanding harmony	Java Programming Fundamentals		Microprocessor And Microcontrollers	Mini Project/ Internship
5	Foundations of Artificial Intelligence	Soft Skill I - Employability Skills	Introduction to Big Data Analytics		Microprocessor And Microcontrollers Lab	Project Phase – 1
6	Connected Business	Soft Skill II - Qualitative And Quantitative Skills	Intelligent Multi Agent & Expert System		Online Course (NPTEL/SWAYAM /Any MOOC approved by AICTE/UGC)	Project Phase – II
7	Cloud Computing		Soft Skill I - Employability		Principles of Management	

			Skills		and Behavioral Science	
8	Machine learning		Soft Skill II - Qualitative And Quantitative Skills			
9	Data Analytics Lab using Machine Learning Algorithm		Universal human values : Understanding harmony			
10	Cloud computing Lab		Foreign Language			
11	Natural Language Processing Concepts & Principles		The Indian Constitution/ The Indian Traditional Knowledge			
12	Deep Learning Principles					
13	Essentials of Machine Learning					

I SEMESTER

COURSE CODE	COURSE NAME : TECHNICAL ENGLISH	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBEN22001	Prerequisite : Pass in Plus 2 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/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 career.

COURSE OUTCOMES (Cos): Students will be able to

CO1	Refresh and stimulate their English learning through Content Integrated Language Learningming
CO2	Have an in-depth understanding of the components of English language and its use in 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 in 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	

3/2/1 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
EBEN22001	TECHNICAL ENGLISH	Ty	2	0/0	0/0	2

Unit I Vocabulary Development: **6Hrs**

Affixes: prefixes and suffixes and word formation–synonyms and antonyms-nominal compounds, expanding using numbers and approximation - preposition, prepositional phrases, preposition + relative pronoun- 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 6Hrs

Interpretation of diagrams - tables, flow charts, pie charts and bar charts, and their use in Business reports

Total Hours: 30

Text book:

Panorama_: Content Integrated Language Learning for Engineers, M. ChandrasenaRajeswaran&R.Pushkala,, Vijay Nicole Imprints Pvt. Ltd., Chennai

References:

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

COURSE CODE	COURSE NAME: 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/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 problems in 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	Transform a non-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	

3/2/1 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
EBMA22001	MATHEMATICS – I	Ty	3	1/0	0/0	4

UNIT I ALGEBRA 12Hrs

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

UNIT II MATRICES 12Hrs

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley - Hamilton theorem(without proof) – Orthogonal reduction of a symmetric matrix to Diagonal form.

UNIT III TRIGONOMETRY 12Hrs

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

UNIT IV DIFFERENTIATION 12Hrs

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

UNIT V FUNCTIONS OF SEVERAL VARIABLES 12Hrs

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 & Reference Books:

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

COURSE CODE	COURSE NAME: ENGINEERING PHYSICS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBPH22ET1	**Prerequisite: Higher Sec. Physics**	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/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to:

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

COURSE OUTCOMES (Cos): Students will be 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 to day to day 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	1	2	2	2	1		1	2		1
CO2	3	3	2	2	2	2	1		2	2	1	1
CO3	3	3	3	2	2	2	1	1	1	2	1	2
CO4	3	3	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	3	3			
CO2	3	2			
CO3	3	2	1		
CO4	3	2	1	1	
CO5	3	1	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
EBPH22ET1	ENGINEERING PHYSICS	ETL	2	0/0	2/0	3

UNIT I PROPERTIES OF MATTER 12 Hrs

Elasticity - stress, strain and Hook's law - Poisson's ratio - 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 12Hrs

Fundamentals of acoustics - reverberation- reverberation time - factors affecting acoustics. Ultrasonics -Production of ultrasonic waves - detection of ultrasonic waves+ - acoustic grating - application of ultrasonic waves. **Lab Component – 2. Ultrasonic Velocity Determination**

UNIT III WAVE OPTICS 12 Hrs

Huygen`s principle - interference of light – wave front splitting and amplitude – air wedge - Newton`s rings - Michelson interferometer and its applications - Fraunhofer diffraction from a single slit - diffraction grating

Lab Component – 3. Spectrometer – Grating

UNIT IV LASER 12 Hrs

Laser principle and characteristics - amplification of light by population inversion - properties of laser beams: mono-chromaticity, coherence, directionality and brightness - different types of lasers - Ruby laser-Nd-YAG laser-He-Ne laser-CO_2 laser - semiconductor laser - applications of lasers in science, engineering and medicine. **Lab Component – 4. Determination of Wavelength 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, Wavelength Modulated & Polarization Modulated Sensors – Endoscope Applications.**Lab Component – 5. Determination of Numerical Aperture of Optical Fiber**

Total Hours: 60

TEXT BOOKS

1. Brijlal, M. N. Avadhanulu& N. Subrahmanyam, Text Book 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 I VRB 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, Text book of Optics, S. Chand Co., New Delhi, 1989
5. R. Murugeshan, Electricity and Magnetism, S. Chand & Co., New Delhi, 1995
6. Thygarajan K & Ajay Ghatak, Laser Theory and Applications, Macmillan, New Delhi, 1988
7. Dr. S. Muthukumaran,Dr.G.Balaji,S.Masilamani - PHYSICS LABORATORY I & II by Sri Krishna Hitech 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, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

1.To deduce practical application of theoretical concepts
2.To provide and insight into fundamental concepts of chemical thermodynamics
3.To articulate the water treatment methods
4. To impart the knowledge in electrical conductance and EMF
5. To create awareness about the modern Nano composites along with concepts of polymers
6.To introduce 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 fundamentals and demonstrate 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	**Analyse 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			

3/2/1 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
EBCH22ET1	ENGINEERING CHEMISTRY	ETL	2	0/0	2/0	3

UNIT -I CHEMICAL THERMODYNAMICS **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 – Demineralization methods. Desalination processes-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 ELECTROCHEMISTRY **12 Hrs**

Conductance – Types of conductance and its Measurement. Electrodes and electrode potential, Nernst equation – EMF measurement and its applications-Electrochemical series- Types of electrodes-Reference Electrodes-Standard hydrogen electrode- Saturated calomel electrode-Determination of P^H using this electrode. **Lab Component-4. Studies on acid-base conductometric titration.**

5. Determination of redox potentials using potentiometry

UNIT –V POLYMERS AND NANO COMPOSITES **12 Hrs**

Polymers-Introduction-Monomers – Functionality – Degree of polymerization-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*Engineering Chemistry* 17th Edition, Dhanpat Rai Publishing Company
2. Vasant R. Gowariker,, N. V. Viswanathan, Jayadev Sreedhar, *Polymer Science*,New Age International, 1986
3. B.K. Sharma, *Polymer Chemistry*, Goel Publishing House
4. Y. R. Sharma ,*Elementary Organic Spectroscopy*, S.Chand& Company Ltd.
5. N.Krishnamurthy, K.Jeyasubramanian, P.Vallinayagam, Applied Chemistry, Tata McGraw-Hill Publishing Company Limited, 1999.
6.Chichester,polymer-clay-nano composites,Johnwiley(2000)

COURSE CODE	COURSE NAME : BASIC MECHANICAL & CIVIL ENGINEERING (FOR CIRCUIT BRANCHES)	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/IE: Theory /Lab/Embedded Theory 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 of metals forming, joining process and apply in suitable machining process
CO3	Understand the various machining process in machine tool
CO4	Utilize the conceptof Building materials and construction able 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	

3/2/1 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
EBME22ET1	BASIC MECHANICAL & CIVIL ENGINEERING (FOR CIRCUIT BRANCHES)	ETL	2	0/0	2/0	3

UNIT I THERMAL ENGINEERING 12 Hrs

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

Lab component: Study of Boilers and IC engines

UNIT II MANUFACTURING PROCESS 12 Hrs

Metal forming processes – Rolling, forging, drawing, extrusion and sheet metal operations- fundamentals only. Metal Joining processes – Welding - arc and gas welding, 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, L and dovetail joints)

UNIT III MACHINING PROCESS 12Hrs

Basics of metal cutting operations – Working of lathe- parts-Operations performed. Drilling machine – Classification – Radial drilling machine - Twist drill nomenclature. 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 - Test on bricks - Cement – Types, Properties and uses of 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 (Tee halving, Cross Lap, Dovetail Joint)

Plumbing works- Pipe connections

UNIT V ROADS, RAILWAYS, BRIDGES & DAMS 12 Hrs

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

Total Hours: 60

TEXT BOOKS

1. S. Bhaskar, S. Sellappan, H.N.Sreekanth,, (2002), "*Basic Engineering*" –Hi-Tech Publications
2. K. Venugopal, V. Prabhu Raja, (2013-14), "*Basic Mechanical Engineering*", Anuradha Publications.
3. K.V. Natarajan (2000), *Basic Civil Engineering,*Dhanalakshmi Publishers
4. S.C. Sharma(2002),*Basic Civil Engineering,*Dhanpat Raj Publications

REFERENCES

1. PR.SL. Somasundaram, (2002), "Basic Mechanical Engineering" –, Vikas Publications.
2. S.C. Rangawala(2002), Building Material and Construction, S. Chand Publisher

COURSE CODE EBCS22ET1	COURSE NAME: 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/IE: Theory /Lab/Embedded Theory 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 in preparation 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	To perform 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	

3/2/1 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

EBCS22ET1	C PROGRAMMING AND MS OFFICE TOOLS	ETL	1	0/0	2/0	2

UNIT I Introduction 9Hrs

Basic Structure of C programme- Constants, Variables and data types, Keywords, Identifiers- Operators and expressions- executing a C Program

UNIT II Decision making statements and looping statements 9Hrs

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

UNIT III Arrays and Functions 9Hrs

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 9Hrs

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 9Hrs

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-Power point

Total Hours: 45

TEXT BOOKS:

1. E.Balaguruswamy, Programming in ANSI C
2. Padma Reddy ,Computer Concepts & 'C' Programming
3. ShobhaHangirke, Computer Application For Business

List of Experiments : C PROGRAMMING

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 sum of the digits of the given number
12. Display Fibonacci series up to N terms
13. Check whether a given character is 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 Worksheet showing the monthly sales of a company in different branch offices
21. Prepare a Statement for displaying Result of 10 students in 5 subjects
22.

COURSE CODE	COURSE NAME : 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/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 &S have career dreams
- Understand difference between ideas & opportunities
- Identify components & create action plan.
- Use brainstorming 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	Do a self-analysis to build an entrepreneurial career.
CO3	Articulate an effective elevator pitch.
CO4	Analyze the local market environment & demonstrate the ability to find an attractive market
CO5	Identify the required 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	

3/2/1 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
EBCC22I01	ORIENTATION TO ENTREPRENEURSHIP & PROJECT LAB	IE	1	0/0	1/0	1

UNIT I CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR 6 Hrs

Introduction to entrepreneurship education – Myths about entrepreneurship – How has entrepreneurship changed the country – Dream it. Do it - Idea planes - Some success stories – Global Legends – Identify your own heroes.

UNITII ENTREPRENEURIAL STYLE 6 Hrs

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

UNIT III DESIGN THINKING 6 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 6 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 6 Hrs

How to choose a topic – basic skill sets necessary to take up a project – creating a prototype – Pitch your project – Project presentation.

Total Hours:30

Reference Books& Website

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

II SEMESTER

COURSE CODE: **EBMA22003**	COURSE NAME **:** **MATHEMATICS-II**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	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/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:
The students should be made to

- To be able to understand basic concepts in integration
- To understand the concepts in multiple integrals
- To use the basic concepts in ordinary differential equations
- To be able to apply concepts of analytical geometry
- To be able to understand the basic concept of vector calculus

COURSE OUTCOMES (COs): Students will be able to

CO1	Integrate the given function by using methods of integration and to find the area under curve and the volume of a solid by revaluation
CO2	Evaluate the multiple integrals /area/volume and to change the order of integration
CO3	Apply concepts in Ordinary Differential equations and to solve eulers differential equation
CO4	Find equation of planes, lines and sphere and shortest distance between skew lines
CO5	Verify green/stokes/gauss divergence theorem

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	1	2	2	2	1	3
CO2	3	3	1	2	2	3	2	2	3	3	2	2
CO3	3	3	1	2	2	3	1	1	3	3	2	2
CO4	3	3	2	2	1	2	2	2	2	3	2	2
CO5	3	3	1	2	2	2	2	1	2	3	1	2

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	

3/2/1 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/ ET/IEL	L	T/S.Lr	P/R	C
EBMA22003	MATHEMATICS – II	Ty	3	1/0	0/0	4

UNIT I INTEGRATION 12Hrs

Basic concepts of Integration – Methods of Integration– Integration by substitution – Integration by parts – Definite integrals– Properties of definite integrals – Problems on finding Area and Volume using single integrals (simple problems).

UNIT II MULTIPLE INTEGRALS 12 Hrs

Double integral in Cartesian and Polar Co-ordinates – Change of order of integration – Triple integral in Cartesian Co-ordinates – Spherical Polar Co-ordinates – Change of variables (simple problems).

UNIT III ORDINARY DIFFERENTIAL EQUATIONS 12Hrs

First order differential equations – Second and higher order linear differential equations with constant coefficients and with RHS of the form: e^{ax}, x^n, Sin ax, Cos ax, $e^{ax}f(x)$, x f(x) where f(x) is Sin bx or Cos bx – Differential equations with variable coefficients (Euler's form) (simple problems).

UNIT IV THREEDIMENSIONAL ANALYTICAL GEOMETRY 12 Hrs

Direction Cosines and Ratios – Equation of a straight line – Angle between two lines – Equation of a plane – Co-planar lines – Shortest distance between skew lines – Sphere – Tangent plane.

UNIT V VECTOR CALCULUS 12 Hrs

Scalar and Vector functions – Differentiation – Gradient, Divergence and Curl – Directional derivatives – Irrotational and Solenoidal fields– Line, Surface and Volume integrals – Green's, Stoke's and Gauss divergence theorems (statement only) – Verification.

Total Hours: 60

Reference Books:

1) Kreyszig E., *Advanced Engineering Mathematics (10th ed.)*, John Wiley & Sons, (2011).

2) Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers, (2012).

3) John Bird, *Basic Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2010).

4) Veerarajan T., *Engineering Mathematics (for first year)*, Tata McGraw Hill Publishing Co., (2008).

5) P.Kandasamy, K.Thilagavathy and K. Gunavathy, *Engineering Mathematics Vol. I (4th Revised ed.)*, S.Chand& Co., Publishers, New Delhi (2000).

6) John Bird, *Higher Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2006).

COURSE CODE	COURSE NAME: SOLID STATE PHYSICS	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBPH22001	**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/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

The students should be made to

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

COURSE OUTCOMES (Cos):Students will be able to

CO1	Enable the student to employ the classical & quantum theories & Laws in 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	3	2	2	2	1	1			2		1
CO2	3	3	1	2	2	1	1		1	2		1
CO3	3	3	3	3	2	2	2	1		2	1	1
CO4	3	3	3	3	2	2	1	1	3	2	1	1
CO5	3	2	2	2	2	1	1	1	2	2	1	1

COs/PSOs	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	1		
CO2	3	3	1		
CO3	2		1		
CO4	1			1	
CO5	2	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/ ET/IEL	L	T/S.Lr	P/R	C
EBPH22001	SOLID STATE PHYSICS	Ty	3	0/0	0/0	3

UNIT I CRYSTAL STRUCTURE 9Hrs

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 – Ceramic Materials & Graphite Structures – Crystal Growth Techniques (Slow Evaporation Method & Melt Growth)

UNIT II CONDUCTORS & SUPER CONDUCTORS 9Hrs

Qualitative analysis of Free electron theory – Electrical & Thermal Conductivity (Derivation) - Fermi energy & its importance – Qualitative analysis of conductors, semiconductors & insulators – Important electrical materials

Superconductors – 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 SEMICONDUCTOR PHYSICS 9Hrs

Bonds in Semiconductors – Types – Importance of Germanium & Silicon – Other Commonly Used Semiconducting materials - Carrier concentration in Intrinsic Semiconductors (Electron and Hole Density) – Band Gap Determination – Carrier Transport in Semiconductors – Drift, Mobility and Diffusion – Hall effect – Determination of Hall Coefficient and its Applications – Dilute Magnetic Semiconductors (DMS) & their Applications construction, working and characteristics of semiconductor diode, Zener diode, transistor (n-p-n and p-n-p transistor), Transistor characteristics (CB, CE, CC), JFET (Construction and its characteristics).

UNIT IV MAGNETIC & DIELECTRIC PHYSICS 9Hrs

Magnetic Materials: Types – Comparison of Dia, Para and Ferro Magnetism – Heisenberg's interpretation –Domain theory – Hysteresis – Soft and Hard Magnetic Materials – Application of Magnetic Resonance Imaging – Important Magnetic, Insulating & Ferro electric materials.

Dielectric Materials: Electrical Susceptibility – Dielectric Constant – Concept of Polarization – Frequency and Temperature Dependence of Polarization – Dielectric loss – Dielectric breakdown – Commonly used Dielectric materials and their practical applications.

UNIT V OPTO ELECTRONICS 9Hrs

Properties & Classification of Optical Materials – Absorption in Metals, Insulators & Semiconductors – Composite Materials – Nano Materials – Bio Materials – MEMS – NEMS – LED's – Organic LED's – LCD's – Laser diodes – Photodetectors – Tunneling – Resonant Tunneling Diodes (RTD's) – Carbon Nanotubes – Various Ttypes of Optical Materials with Properties.

Total Hours :45

TEXT BOOKS & REFERENCE BOOKS

1. V. Rajendran&Mariakani "Materials Science", Tata McGraw Hill (2004).
2. P.K.Palanisamy," Materials science", Scitech Publication(2002).
3. Dr. SenthilKumar,"Engineering Physics II" VRB Publishers (2016).
4. V. Arumugam, Materials Science", Anuradha Agencies, (2003 Edition).
5. Pillai S.O., "Solid State Physics", New Age International, (2005)

COURSE CODE	COURSE NAME: TECHNICAL CHEMISTRY	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBCH22002	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/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

1.Toidentify the application of semiconductors 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 lifelong 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		

3/2/1 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
EBCH22002	TECHNICAL CHEMISTRY	Ty	3	0/0	0/0	3

UNIT – 1 CHEMISTRY OF SEMICONDUCTORS **9Hrs**

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

UNIT -2 ELECTROCHEMICAL CELLS AND BATTERY TECHNOLOGY 9 Hrs

Electrochemical cells: Galvanic cell (Daniel cell); Batteries: Classification of batteries, primary batteries (dry cells) and secondary batteries -nickel-cadmium, lead-acid battery, Solid state batteries – Lithium battery, Lithium Sulphur battery, Fuel cells.

UNIT -3 DEVICECORROSION **9Hrs**

Introduction – chemistry of IC and PCB- causes of corrosion on 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 **9Hrs**

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

9Hrs

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. Samuel Glasstone, *An Introduction of Electrochemistry*, Franklin Classics Trade Press.
3. Kharton V.V, *Solid state electrochemistry I*I: Electrodes, interfaces and ceramic membranes, Wiley
4. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company.
5. *Chemdraw 16.0 User Guide* ,Perkin Elmer Informatics Inc.
6. Rolf E. Hummel, *Electronic Properties of Materials,* Springer
7.

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/IE/IE: 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 useful 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				

3/2/1 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
EBME22001	ENGINEERING GRAPHICS	Ty	2	0/0	2/0	3

CONCEPTS AND CONVENTIONS (Not for examination) **3**Hrs

Introduction to drawing, importance and areas of applications – BIS standards – IS: 10711 – 2001 : Technical products Documentation – Size and layout of drawing sheets – IS 9606 – 2001: Technical products Documentation – Lettering – IS 10714 & SP 46 – 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 12Hrs

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 in simple position only.

UNIT II PROJECTION OF SOLIDS 12 Hrs

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

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

UNIT III DEVELOPMMENT OF SURFACES 12 Hrs

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

UNIT IV ISOMETRIC PROJECTION 12 Hrs

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

UNIT V ORTHOGRAPHICS PROJECTIONS **6**Hrs

Orthographic projection of simple machine parts – missing views

BUILDING DRAWING **3Hrs**

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. and Panchal, V.M. (2014) Engineering Drawing Charotar Publishing House
2. Gopalakrishnan, K.R. (2014) Engineering Drawing (Vol.I& II Combined) Subhas Stores, Bangalore.
3. Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
4. Venugopal K. and Prabhu Raja V., “Engineering Graphics", New Age International (P) Limited, 2008.

COURSE CODE	COURSE NAME:	Ty/Lb/ ETL/IE	L	T/ S.Lr	P/R	C
EBCS22001	FUNDAMENTALS OF COMPUTER ENGINEERING					
	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/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students 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): Students will 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 trends and 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**				**1**		1	
CO2	**2**	**1**	**1**	**2**	**1**				**1**			
CO3	**2**	**2**	**1**	**2**	**1**				**1**			
CO4	**1**	**2**	**1**	**2**	**1**				**1**		1	**1**
CO5	**1**	**1**	**1**	**2**					**1**		1	**1**

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3	**1**			
CO4		**1**	**1**	
CO5	**1**	**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
EBCS22001	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 — Number Systems

UNIT II COMPUTER SOFTWARE & HARDWARE **9 Hrs**

Basic Operations-Computer Software & Hardware –Types of Software –Scripting languages-Hardware components-compiler-interpreter-Assembler

UNIT III PROBLEM SOLVING AND OS BASICS **9 Hrs**

Planning the Computer Program – Purpose – Algorithm – Flowcharts – Pseudocode -Application Software Packages- Types (LAN, WAN and MAN), Data communication, topologies.

UNIT IV INTERNET **9 Hrs**

Overview, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopher etc., Search engines, E-mail, Web Browsers. Internet of Things (IoT): Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.

UNIT V EMERGING TECHNOLOGIES IN COMPUTING **9 Hrs**

Overview-Artificial Intelligence- Grid computing- Green computing- Big data analytics- Quantum Computing and Brain Computer Interface- IoT in Agriculture- Image processing in medical field

Total Hours:45

TEXT BOOKS:

1. Pradeep K. Sinha and Priti Sinha, 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 Rajesh K. Shukla, Basic Computer Engineering, WileyIndia, 2011.

REFERENCE:

1. Bhanu Pratap,, 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 Plus 2 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/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To engage students in meaningful 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	Have an in-depth understanding of the components of English language and its use in oral 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 in 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	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	

3/2/1 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
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, analysing newspaper headings and reports, interpreting Advertisement pamphlets

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

Prescribed Book: J. C. Richards with J. Hull &S. Proctor, Interchange, Cambridge University Press, 2015.

Unit III **Reading** **6 Hrs**

Extensive, focused reading,

Strategies for effective reading - Reading comprehensions – Note making- summarising- paraphrasing, Review

Suggested reading: Short stories, news paper reports, film reviews

Unit IV **Writing** **6 Hrs**

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

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

Interpretation of charts Flow chart, pie chart, bar diagram, table, tree diagram, etc.,

Total Hours:30

Prescribed Text:

1. J. C. Richards with J. Hull &S.Proctor, Interchange, Level 2, Cambridge University Press, 2021.
2. M. ChandrasenaRajeswaran&R.Pushkala, English - Communication Lab Work book

Reference

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 EBCS22ET2	COURSE NAME: PYTHON PROGRAMMING	Ty /Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: C PROGRAMMING AND MS OFFICE TOOLS	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/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:
The students should be made to

- Develop a basic understanding of *programming* and the *Python programming* language
- Write programs in Python to solve real world problems
- See the value of *programming* in a variety of different disciplines, especially as it relates in engineering.

COURSE OUTCOMES (COs): Students will be able to

CO1	Remember the syntax and semantics of python programming language
CO2	Understand how functional and operations are to be utilized
CO3	Applythe fundamental programming constructs like variables, conditional logic, looping, and functions to build basic programs
CO4	design object-oriented programs with Python classes
CO5	Apply the knowledge to solve various real-world problems

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	2	1	1	1	1		1	1
CO2	3	2	2	2	2	1	1	1	1		1	1
CO3	3	2	2	2	2	1	1	1	1		1	1
CO4	3	3	3	2	2	1	2		2		2	2
CO5	3	3	3	3	2	1	2		2		2	2

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

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

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✔		✔								

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S.Lr	P/R	C
EBCS22ET2	PYTHON PROGRAMMING	ETL	1	0/0	2/0	2

UNIT I: INTRODUCTION **9 Hrs**

History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT II: TYPES, OPERATORS AND EXPRESSIONS **9 Hrs**

Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

UNIT III: FUNCTIONS **9 Hrs**

Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

UNIT IV: 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.

UNIT V: OBJECT ORIENTED PROGRAMMING OOP IN PYTHON **9 Hrs**

Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.

Total Hours: 45

TEXT BOOKS:

1. Python Programming: A Modern Approach, VamsiKurama, Pearson.
2. Think Python:How to Think Like a Computer Scientist'', 2nd editionUpdated for Python 3, Shroff/O'Reilly Publishers,Allen B. Downey
3. Learning Python, Mark Lutz, Orielly.

REFERENCE BOOKS:

1. Core Python Programming, W.Chun, Pearson.
2. Introduction to Python, Kenneth A. Lambert, Cengage.

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/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	Comprehend air, 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 watershed management
CO4	Identify its problems and concerns climate change, global warming, acid rain, 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/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 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 ECOSYSTEM 6 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. Biodiversity at national and local levels – India

UNIT II ENVIRONMENT POLLUTION 6 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 6 HRS

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 6 HRS

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed 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 6 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:

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) Cycle rally
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 live some big environmentalist 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. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGrawHill,NewDelhi, (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.*

III SEMESTER

COURSE CODE	COURSE NAME : **Discrete Mathematics**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
EBMA22006	Prerequisite: First year Engineering Mathematics	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 and Lab/ Internal Evaluation

OBJECTIVES :
The students should be made to
To understand the Basic concepts in Truth Table, Mathematical Logic and Inference Theory
To understand the Basic concepts in Mathematical Induction and Recurrence relations
To understand the Basic concepts in Group theory, Rings and Fields
To understand the Basic concepts in Finite Automata, Finite state machine.
To understand the Basic concepts in Graph theory

COURSE OUTCOMES (COs) : Students will be able to

CO1	To understand the Basic concepts in Logic and Predicate calculus
CO2	To understand the Basic concepts in Combinatorics
CO3	To understand the Basic concepts in Group theory
CO4	To understand the Basic concepts in Automata
CO5	To understand the Basic concepts in Graph theory

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**	**3**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**3**
CO2	**3**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**1**	**3**
CO3	**2**	**3**	**1**	**3**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**3**
CO4	**3**	**3**	**1**	**2**	**1**	**2**	**2**	**1**	**1**	**2**	**1**	**2**
CO5	**2**	**3**	**1**	**2**	**1**	**2**	**2**	**1**	**1**	**2**	**2**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**1**	**3**	**1**
CO2	**2**	**1**	**3**	**1**
CO3	**2**	**1**	**3**	**1**
CO4	**2**	**1**	**3**	**1**
CO5	**2**	**1**	**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: **EBMA22006**	COURSE NAME :	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	DISCRETE MATHEMATICS	Ty	3	1/0	0/0	4

(Common to II yr. / III Sem. B.Tech (Full Time), CSE,IT; ECE(elective))

UNIT I LOGIC 12 hrs

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

UNIT II COMBINATORICS 12hrs

Mathematical Induction – Pigeon Hole Principle – Principle of Inclusion and Exclusion – Recurrence Relations – Generating Functions.

UNIT III GROUPS 12 hrs

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

UNIT IV AUTOMATA 12 hrs

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

UNIT V GRAPHS 12 hrs

Introduction to Graphs – Terminology – Matrix representation of Graphs: Incidence matrix, Adjacency matrix – Graph Isomorphism – Connectivity – Euler and Hamiltonian Paths (simple theorems and problems).

Total Hours: 60

Reference Books:

1) Veerarajan T., *Discrete Mathematics*, Tata McGraw Hill Publishing Co., (2008).
2) Tremblay J.P., Manohar R., *Discrete Mathematical structures with applications to Computer science*, Tata McGraw Hill Publishing Co., (2008).
3) Kolman, Busby, Ross, *Discrete Mathematical Structures*, Pearson, (2014).
4) Kenneth Rosen, *Discrete Mathematics and its applications (SIE)*, Tata McGraw Hill Publishing Co., (2007).

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

OBJECTIVES:

Thestudents 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	PSO3	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 StrengthofCorrelation 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: **EBCS22002**	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 12Hrs

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 12Hrs

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 – IVNON LINEAR DATA STRUCTURES –GRAPHS 12Hrs

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 12Hrs

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

TEXTBOOKS

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

REFERENCE BOOKS

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 : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:

Thestudents 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 (6^{th}ed.) Tata McGraw Hill, New Delhi

REFERENCE BOOKS:

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

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	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
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 **9Hrs**

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: EBAI22001	CourseName : **FOUNDATIONS OF AI**	**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 : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

The students should be made to

- To learn 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**	**PO 9**	**PO10**	**PO1 1**	**PO 12**
CO1	**3**	**2**	**1**	**2**	**3**	**-**	**-**	**1**	**1**	**1**	**-**	**1**
CO2	**3**	**2**	**3**	**2**	**3**	**1`**	**1**	**2**	**1**	**3**	**2**	**1**
CO3	**3**	**2**	**2**	**2**	**3**	**2**	**1**	**3**	**2**	**2**	**2**	**1**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**2**	**1**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**3**	**2**	**1**	**2**	**2**	**1**	**1**	**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
EBAI22001	**FOUNDATIONS OF AI**	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.

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 AND ITS APPLICATIONS **9 Hrs**

Inductive learning-Learning Decision trees-Ensemble Learning-Logical formulation of learning-Explanation based learning-Learning using relevance information-Applications-AI powered assistants-Personalized learning-Autonomous vehicles.

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 :Tutorial SLr: SupervisedLearning P:Project
R:ResearchC:CreditsT/L/ETL:Theory/Lab/Embedded Theoryand Lab

OBJECTIVES:

The students should be made to

Human Values Courses: 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

Mappingof CourseOutcomeswithProgramOutcomes (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**

3/2/1indicatesstrengthofcorrelation3 –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 : UNDERSTANDINGHARMONY	ETL	1	0/0	2/0	2

UNIT I Introduction - Need, Basic Guidelines, Content and Process for ValueEducation 9 HRS

Purposeandmotivationforthecourse,recapitulationfromUniversal HumanValues-I - Self-Exploration– what is it? -Its content and process; 'Natural Acceptance'andExperientialValidation-astheprocessforself-exploration. – ContinuousHappinessandProsperity-AlookatbasicHuman Aspirations – Rightx understanding, Relationship and Physical Facility- the basic requirementsforfulfilmentofaspirationsofeveryhumanbeingwiththeir correct priority- UnderstandingHappinessandProsperitycorrectly-Acriticalappraisal of the currentscenario– Methodtofulfiltheabovehumanaspirations:understandingandliving in harmony atvariouslevels.

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 IIIUnderstanding Harmony in the Family and Society- Harmony in Human-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 IVUnderstanding Harmony in the Nature and Existence-Whole existence asCoexistence 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 VImplications of the above Holistic Understanding of Harmony on ProfessionalEthics 9HRS

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 Books

1. *Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010*

Reference Books

1. *Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.*
2. *Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.*
3. *The Story of Stuff (Book).*
4. *The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.*
5. *Small is Beautiful - E. F Schumacher.*

COURSE CODE: **EBCS22L01**	COURSE NAME: **DATA STRUCTURES LAB**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: C PROGRAMMING AND MS OFFICE TOOLS	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

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: **EBCS22LO2**	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
EBCS22LO2	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

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	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**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 **EBAI22ET1**	COURSE NAME **: JAVA PROGRAMMING FUNDAMENTALS**	**Ty/Lb/ETL /IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite:	ETL	2	0/0	2/0	3

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

OBJECTIVES :

The student should be made to:

1. ToimpartthecorelanguagefeaturesofJavaanditsApplicationProgrammingInterfaces(API).
2. To demonstrate the use of threads,exceptions,files and collection frameworks in Java.
3. TofamiliarizestudentswithGUIbasedapplicationdevelopment anddatabaseconnectivity.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Comprehend Java Virtual Machine architecture and Java Programming Fundamentals.
CO2	DesignapplicationsinvolvingObjectOrientedProgrammingconceptssuchasinheritance, association, aggregation, composition, polymorphism, abstract classes and interfaces.
CO3	Designandbuildmulti-threadedJavaApplications.
CO4	Buildsoftwareusingconceptssuchasfiles,collectionframeworks andcontainers.
CO5	DesignandimplementJavaApplicationsforrealworldproblemsinvolvingDatabase Connectivity.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO 1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO 6**	**P O7**	**PO8**	**PO 9**	**PO 10**	**PO11**	**PO1 2**
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
EBAI22ET1	**JAVA PROGRAMMING FUNDAMENTALS**	ETL	2	0/0	2/0	3

UNIT I JAVA FUNDAMENTALS 12 Hrs

JavaBasics:JavaDesigngoal-FeaturesofJavaLanguage-JVM-Bytecode-Javasourcefile Structurebasicprogrammingconstructs Arraysonedimensionalandmulti-dimensionalenhanced for loop String package

UNIT II OBJECT ORIENTED PROGRAMMING 12 Hrs

ClassFundamentals-ObjectObjectreferencearrayofobjectsconstructorsmethodsover-loading this referencestatic block - nested class inner class garbage collectionfinalize()Wrapper classes Inheritance types –useofsuper -Polymorphism abstract class interfaces packages and sub packages.

UNIT III ROBUSTNESS AND CONCURRENCY 12 Hrs

ExceptionHandling-ExceptionsErrors-TypesofException –ControlFlowinExceptions -Use oftry, catch, finally, throw, throws inException Handling - user defined exceptions – MultithreadingThreadcreationsharingtheworkload amongthreadssynchronizationinterthread communication deadlock

UNIT IV FILES, STREAMS AND OBJECT SERIALIZATON 12 Hrs

Datastructures:JavaI/OstreamsWorkingwithfilesSerializationanddeserializationofobjects Lambdaxpressions,CollectionframeworkList,Map,SetGenericsAnnotations

UNIT V GUI PROGRAMMING AND DATABASE CONNECTIVITY 12 Hrs

GUI program ingusingJavaFX,exploringevents,controlsandJavaFXmenusAccessing DatabasesusingJDBCconnectivity

Total Hours: 60

TEXT BOOKS

1. Herbert Schildt, The Complete Reference-Java, Tata McGraw-Hill Educationa, 10th edition, 217.
2. PaulJ.Deitel,HarveyDeitel,JavaSE8forProgrammers(DeitelDeveloperSeries)3rd Edition, 2014.
3. Y.DanielLiang,IntroductiontoJavaprogramming-comprehensiveversion-TenthEdition, 2015.

REFERENCE BOOKS

1. PaulDeitelHarveyDeitel, Java HowtoProgram,PrenticeHall;9thedition,2011.
2. CayHorstmannBIGJAVA,4thedition,JohnWileySons,2009
3. NicholasS.Williams,ProfessionalJavaforWebApplications,WroxPress,2014.

IV SEMESTER

COURSE CODE **EBMA22011**	COURSE NAME **:** **Statistics for Computer Engineers**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: First year Engineering Mathematics	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 and Lab/ Internal Evaluation

OBJECTIVES :

The students should be made to

- To understand the Basic concepts in Frequency distribution, Measures of Central Tendency and Relative Measures of Dispersion.
- To understand the Basic concepts in Random Events, Random variable and Probability.
- To understand the Basic concepts in Bi-variate data, Coefficient of Correlation and Regression.
- To understand the Basic concepts in Probability distributions
- To understand the Basic concepts in Null hypothesis, Alternative hypothesis and Critical points

COURSE OUTCOMES (COs): Students will be able to

CO1	To understand the Basic concepts in Statistics
CO2	To understand the Basic concepts in Probability
CO3	To understand the Basic concepts in Correlation
CO4	To understand the Basic concepts in Probability distributions
CO5	To understand the Basic concepts in Sampling theory

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**	**3**	**1**	**2**	**1**	**2**	**2**	**1**	**1**	**2**
CO2	**3**	**3**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**2**
CO3	**2**	**2**	**1**	**3**	**1**	**2**	**1**	**1**	**2**	**2**	**2**	**3**
CO4	**3**	**2**	**1**	**3**	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**3**
CO5	**3**	**3**	**2**	**2**	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**1**	**3**	**1**
CO2	**2**	**1**	**3**	**1**
CO3	**2**	**1**	**3**	**1**
CO4	**2**	**1**	**3**	**1**
CO5	**2**	**1**	**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	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBMA22011	STATISTICS FOR COMPUTER ENGINEERS	Ty	3	1/0	0/0	4

Course Outcomes:

To understand the Basic concepts in Statistics
To understand the Basic concepts in Probability
To understand the Basic concepts in Correlation
To understand the Basic concepts in Probability distributions
To understand the Basic concepts in Sampling theory

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 ofProbability - 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

Reference Books:

1) Veerarajan T., *Probability, Statistics and, Random Processes*, Tata McGraw Hill Publishing Co., (2008).
2) Singaravelu, *Probability and Random Processes*, Meenakshi Agency, (2017).
3) Gupta S.C., Kapoor V.K., *Fundamentals of Mathematical Statistics*, S.Chand& Co., (2007).
4) Richard Johnson A., *Miller & Freund's Probability and statistics for Engineers (9th ed)*, Prentice Hall of India, (2016).

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 : 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 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

- understand the 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 (10^{th} 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.*
3. *William Stallings (2015) Operating Systems (8 th ed.) Prentice Hall of India*

COURSE CODE: EBEC22ID2	COURSE NAME: MICROPROCESSORS AND MICROCONTROLLERS	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: DIGITAL PRINCIPLES AND SYSTEM DESIGN	TY	3	0/0	0/0	3

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:

Thestudents should be made to

- To study the basic architectures and operational features of the processors and controllers.
- To learn the assembly language and programming of 8086.
- To design and understand the multiprocessor configuration.
- To understand the interfacing concepts of the peripheral devices with processors.

COURSE OUTCOMES (Cos): Students will be able to	
CO1	Describe the working of 8086 Microprocessor
CO2	Demonstrate the programming in microprocessor
CO3	Analyze the interfacing of different peripheral devices with the microprocessors
CO4	Explain the operation of 8051 microcontroller in real time process
CO5	Illustrate the applications of 8051

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	3	3	2	1	1	2	1	2	2	2
CO2	3	3	3	3	2	1	2	2	2	2	2	2
CO3	2	3	3	3	3	2	2	2	1	3	2	2
CO4	3	3	3	3	3	1	2	2	2	2	2	3
CO5	3	3	3	3	3	1	2	2	1	1	3	3

Cos /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	1
CO2	2	3	3	1
CO3	3	3	3	2
CO4	3	3	3	1
CO5	2	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
EBEC22ID2	MICROPROCESSORS AND MICROCONTROLLERS	Ty	3	0/0	0/0	3

UNIT I: THE 8086 MICROPROCESSORS **9 Hrs**

Introduction to 8086 – Microprocessor architecture – Addressing modes – Instruction set and assembler directives – Assembly language programming

UNIT II :8086 SYSTEM BUS STRUCTURE **9 Hrs**

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, closely coupled and loosely Coupled configurations

UNIT III I/O INTERFACING **9 Hrs**

Memory Interfacing and I/O interfacing – Parallel communication interface – Serial communication interface – D/A and A/D Interface – Timer – Keyboard /display controller – Interrupt controller – DMA controller

UNIT IV: MICROCONTROLLER **9 Hrs**

Architecture of 8051 – Special Function Registers (SFRs) – I/O Pins Ports and Circuits – Instruction set – Addressing modes.

UNIT V: INTERFACING MICROCONTROLLER **9 Hrs**

Programming 8051 Timers – Serial Port Programming – Interrupts Programming – LCD & Keyboard Interfacing – ADC, DAC & Sensor Interfacing – External Memory Interface- Stepper Motor and Waveform generation.

Total Hours: 45

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, ―Microcomputer Systems: The 8086 / 8088 Family – Architecture, Programming and Design‖, Second Edition, Prentice Hall of India, 2007.

2. Mohamed Ali Mazidi, Janice GillispieMazidi, Rolin McKinlay, ―The 8051 Microcontroller and Embedded Systems: Using Assembly and C‖, Second Edition, Pearson education, 2011.

REFERENCES:

1. DoughlasV.Hall, ―Microprocessors and Interfacing, Programming and Hardware‖,TMH,2012

2. A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012

COURSE CODE: **EBCC22I04**	COURSE NAME **THEINDIAN 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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES:

The students should be made to

- To provideanoverview of thehistoryofthemakingofIndianConstitution
- To understandthepreambleandthebasic structures oftheConstitution.
- To Know the fundamentalrights, dutiesandthedirectiveprinciplesof state policy
- To understand the functionality of the legislature, theexecutiveand thejudiciary

COURSE OUTCOMES (Cos): Students will be able to

CO1	To provideanoverview of thehistoryofthemakingofIndianConstitution
CO2	To understandthepreambleandthebasic structures oftheConstitution.
CO3	To Know the fundamentalrights, dutiesandthedirectiveprinciplesof 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	THEINDIAN CONSTITUTION (Audit Course)	IE	2	0/0	0/0	0

UNIT I **6Hrs**

The HistoryoftheMakingof IndianConstitution, Preamble andthe BasicStructures

UNIT II **6Hrs**

FundamentalRightsand Duties, Directive Principlesof State Policy

UNIT III **6Hrs**

Legislature, Executive and Judiciary

UNIT IV **6Hrs**

EmergencyPowers

UNIT V **6Hrs**

Special Provisions for Jammu andKashmir, Nagalandand OtherRegions, Amendments

Total Hours: 30

TEXT BOOKS:

1. D DBasu, Introductiontothe Constitutionof India,20th Edn., LexisnexisButterworths, 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: **THEINDIAN 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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES: T
he 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

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	THEINDIAN 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: **EBEC22IL2**	COURSE NAME: **MICROPROCESSORS AND MICROCONTROLLERS LAB**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: DIGITAL SYSTEMS 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

OBJECTIVES:

Thestudents should be made to

- To learn the assembly language programming of 8086.
- To learn the assembly language programming of 8051.
- To understand the interfacing concepts of the peripheral devices with processors

COURSE OUTCOMES (Cos) : Students will be able to

CO1	Ability to understand the Programming of 8086 microprocessor
CO2	Ability to understand the Programming of 8051 microcontroller
CO3	Understand the applications of microprocessors & microcontrollers

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**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**2**
CO2	**3**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**2**
CO3	**3**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**		
CO1	**3**	**2**	**1**	**1**		
CO2	**3**	**2**	**1**	**1**		
CO3	**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
EBEC22IL2	MICROPROCESSORS AND MICROCONTROLLERS LAB	Lb	0	0/0	3/0	1

Inter disciplinary Lab II- Microprocessor and Microcontrollers

LIST OF EXPERIMENTS:

8086 Programs using kits/MASM

1. Basic arithmetic and Logical operations

2. Move a data block without overlap

3. sorting and searching

Peripherals and Interfacing Experiments

4. Traffic light controller

5. Stepper motor control

6. Key board and Display

7. Serial interface and Parallel interface

8. A/D and D/A interface and Waveform Generation

8051 Experiments using kits/ MASM

9. Basic arithmetic and Logical operations

10. Move a data block without overlap

11.sorting and searching

8086/8051 Programs using kits/MASM

12.Code conversion, decimal arithmetic and Matrix operations.

Total Hours:45

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 : 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/IE	L	T/S.Lr	P/R	C
EBCS22L03	DESIGN AND ANALYSIS OF ALGORITHMS LAB	Lb	0	0/0	3/0	1

List of Experiments

3. 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.
4. Write a program to analyse all the complexity of Strassen matrix with minimum matrix size of 4*4
5. Compute the transitive closure of a given directed graph by using Warshall's algorithm.
6. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
7. 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.
8. To write a program to solve the knapsack problem using greedy method.
9. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
10. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
11. 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: DBMS 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

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 : **INTRODUCTION TO BIG DATA ANALYTICS**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
EBAI22ET2	Prerequisite: DBMS	**ETL**	**2**	**0/0**	**2/0**	**3**

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

OBJECTIVE :

The students should be made to

- To optimize business decisions and create competitive advantage with Big Data analytics
- To explore the fundamental concepts of big data analytics.
- To learn to analyze the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts.
- To introduce programming tools PIG & HIVE in Hadoop echo system.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the concept of big data
CO2	Recognize the importance and relevance of data handling Models
CO3	Design the efficient method for data handling.
CO4	Learn various techniques and implement in programming tools.
CO5	Will understand the application of map reduce concept

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	3	3	2	3	2	2	2	3
CO2	3	3	2	3	2	3	2	1	3	2	3	3
CO3	3	3	2	3	2	2	3	3	3	3	2	3
CO4	3	3	2	3	2	2	3	2	2	1	3	2
CO5	3	3	2	3	2	3	2	3	3	3	2	3

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	3
CO2	3	2	3	3
CO3	3	3	2	3
CO4	3	2	3	3
CO5	3	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
EBAI22ET2	INTRODUCTION TO BIG DATA ANALYTICS	ETL	2	0/0	2/0	3

UNITI INTRODUCTION TO BIG DATA 12 Hrs

Introduction to Big Data Platform — Challenges of Conventional Systems-Intelligent data analysis—Nature of Data-Analytic Processes and Tools - Analysis vs Reporting.

UNIT II MINING DATA STREAMS12 Hrs

:Introduction To Streams Concepts — Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream-Filtering Streams— Counting Distinct Elements in a Stream—Estimating Moments—Counting Oneness in a Window— Decaying Window-Realtime Analytics Platform (RTAP) Applications- Case Studies- RealTime Sentiment Analysis-Stock Market Predictions.

UNITIII HADOOP 12 Hrs

History of Hadoop- the Hadoop Distributed File System-Components of Hadoop Analysing the Data with Hadoop-Scaling Out-Hadoop Streaming-Design of HDFS-Java interfaces to HDFS Basics-Developing a MapReduce Application-HowMap Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort — Task execution - Map Reduce Types and Formats- Map Reduce Features- Hadoop environment.

UNITIV BIG DATA USING PIG AND HIVE 12 Hrs

Data processing operators in Pig—Hive services—Hive QL—Querying Data in Hive-fundamentals of HBase and ZooKeeper-IBM InfoSphere Bi gInsights and Streams.

UNIT V PREDICTIVE ANALYTICS12 Hrs

Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems – real time applications.

Total Hours :60

TEXT BOOKS

1. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing,2012.
2. MichaelBerthold,DavidJ.Hand,"IntelligentDataAnalysis",Springer,2007.

REFERENCE BOOKS

1. TomWhite"Hadoop:The Definitive Guide"Third Edition,O'reilly Media,2012.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets",CUP, 2012.
3. BillFranks,"Taming the Big DataTidal Wave:Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons,2012.
4. GlennJ.Myatt,"Making Sense of Data",JohnWiley&Sons,2007.
5. Pete Warden, "Big Data Glossary", O'Reilly,2011.
6. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", 2nd Edition, Elsevier, Reprinted2008.

COURSE CODE: EBCS22I01	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
EBCS22I01	**TECHNICAL SKILL I (EVALUATION)**	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/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

- Become good listeners to get engaged in interactive communication for effective team building.
- Develop assertive and adaptive behaviour to be leaders
- Develop peer interaction for a successful lifelong learning.
- Learn skills necessary for a cooperative living in academic and professional environments
- Use soft skills for the purposes of research and follow ethics in society and profession

COURSE OUTCOMES (Cos) : Students will be able to

CO1	Become good listeners to get engaged in interactive communication for effective team building.
CO2	Develop assertive and adaptive behaviour to be leaders
CO3	Develop peer interaction for a successful lifelong learning.

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	3			
CO2	3	3	3	1	2	2	1	2	3			
CO3	3	3	3	1	2	2	1	2	3			

Cos /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2
CO2	2	2	2	2
CO3	3	2	2	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
EBCC22I06	**SOFT SKILL I**-Employability skills	IE	0	0/0	2/0	1

Prefatory Note

This paper aims to equip students with skills essential for work place and global environment to which they will move on from the university, once they complete the course. As such, this paper provides students with a set of ten interlinked soft skills: Listening, team work, emotional intelligence, assertiveness, learning to learn, problem solving, attending interviews, adaptability, non-verbal communication and written communication. Students will get engaged in pair work, group work, role play, discussion, presentation, storytelling, writing assignments etc.,

Unit -I

Listening, Speaking, Reading and Writing skills (LSRW)

Unit -II

Team work skills: adaptability, emotional intelligence, learning skills

Unit -III

Leadership Qualities: assertiveness, reasoning, compassion and compatibility

Unit -IV

Problem solving: willingness to learn, creative thinking, developing observation skills

Unit -V

Interview skills: employability skills, resume writing

Total Hours:30

Suggested reading

S.P. Dhanavel, English and Soft Skills, Vol. 1, Orient Blackswan Pvt. Ltd. 2010

V SEMESTER

COURSE CODE: **EBCS22006**	COURSE NAME: **COMPUTER ORGANIZATION AND ARCHITECTURE**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Microprocessor and Microcontrollers	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 and Lab/ Internal Evaluation

OBJECTIVES:

Thestudents should be made to

- Conceptualize the major components of a computer including CPU, memory, I/O and storage, understand the uses for cache memory,
- understand a wide variety of memory technologies both internal and external,
- understand the role of the operating system in interfacing with the computer hardware

COURSE OUTCOMES (Cos): Students will be able to

CO1	Understand the theoretical basics of central processing unit[L2]
CO2	Understand the basic operations of CPU[L2]
CO3	apply the knowledge gained and Designa central processing unit[L3]
CO4	apply the concepts of memory organization and I/O processing unit[L2]
CO5	Analyze the execution of simple instruction[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**	**2**	**2**						**1**		**1**	**1**
CO2	**3**	**3**	**3**						**1**		**1**	**1**
CO3	**3**	**2**	**2**								**1**	**1**
CO4	**3**	**3**	**3**	**1**				**1**			**1**	**1**
CO5	**3**	**2**	**3**	**1**				**1**	**1**		**1**	**1**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**1**		**1**
CO2	**3**	**2**	**1**	
CO3	**-**	**3**	**1**	
CO4	**2**	**2**		**1**
CO5	**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
EBCS22006	COMPUTER ORGANIZATION AND ARCHITECTURE	Ty	3	1/0	0/0	4

UNIT I BASIC STRUCTURE OF COMPUTERS 12 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. Case study – instruction sets of some common CPUs.

UNIT II ARITHMETIC AND LOGIC UNIT 12 Hrs

Data representation: signed number representation, fixed and floatingpoint representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division – non-restoring and restoring techniques, floating point arithmetic.

UNIT III PROCESSOR UNIT 12 Hrs

Data path implementation-Control unit-hardwired control – micro programmed control, nano programming -Concepts of pipelining – Pipeline hazards

UNIT IV MEMORY SYSTEM 12 Hrs

Memory hierarchy-Internal organization of RAM – ROM – Interleaved Memory-Cache and associative memories -Virtual memory – Memory organization and cache coherence issues

UNIT V INPUT/OUTPUT AND PERIPHERALS 12 Hrs

Input-output subsystems, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions.

Total Hours: 60

TEXT BOOKS:

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier Publishers, Fouth Edition, 2012.
2. John Hayes (2012) ,(2007)digitized Computer Architecture and Organization, Tata McGraw Hill
3. Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1. Morris Mano (2009) Computer System Architecture,(3rd ed.),Pearson Education

Subject Code: EBCS22007	COURSE NAME: COMPUTERNETWORKS	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:ResearchC:Credits
T/L/ETL:Theory/Lab/EmbeddedTheoryandLab/ Internal Evaluation

OBJECTIVE:

The students should be made to

- Remember how the networks functions takes place
- Understandhowcommunicationtakesplaceinvariousmediums
- Learnabouttheprotocolsfordatacommunicationinthe networklayers
- Studyaboutthevariousnetwork algorithmsfor smoothdatacommunication

COURSEOUTCOMES(COs: Students will be able to

CO1	Studentswillunderstandandrememberhownetworkworks. [L2]
CO2	Studentswillhave knowledgeon Ipaddress andanalyzetheprotocols. [L1]
CO3	Applyknowledgeaboutprotocolstoavoidcongestion. [L3]
CO4	Acquaintancetoapplyalgorithmsinnetworks. [L4]
CO5	Willunderstandhowlayersofnetworkswork. [L2]

MappingofCourseOutcomeswith ProgramOutcomes (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

3/2/1IndicatesStrengthOfCorrelation,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
EBCS22007	COMPUTERNETWORKS	Ty	3	0/0	0/0	3

UNITI INTRODUCTION 9Hrs

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.

UNITII DATALINKLAYER 9Hrs

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

UNITIII NETWORKLAYER 9Hrs

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.

UNITIV TRANSPORTLAYER 9Hrs

Transport layer design issues – Transport protocols – Simple transport protocol – Internet transport protocols UDP, TCP – Flow Control – Congestion control – Congestion avoidance

UNITV APPLICATION LAYER 9Hrs

Domainnamesystem-Electronicmail–IntroductiontoWorldWideWeb: HTTP, APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet, RTP.

TotalHours:45

TEXTBOOKS:

1. PetersonDavie(2012) ComputerNetworks-AsystemApproach (2nd ed.),MorganKauffmanHarcourt Publishers.
2. JamesF.Kurose,Keith W.RossComputerNetworking:Atop-DownApproach/Edition6, Pearson publication,2012.

REFERENCEBOOKS:

1. *AndrewS. Tanenbaum. DavidJ. Wetherall,"ComputerNetworks"5thEditionPHI,2011*
2. *WilliamStallings," Dataandcomputer communications", PHI,2001*
3. *DouglasE.comer,"Internetworkingwith TCP/IP-Volume-I",PHI,5thedition2006*
4. *Godbole, "Data communicationandnetworking",TMH,2004.*
5. *ForouzanB.A., "DataCommunicationsandnetworking", TMH, 2003.*

COURSE CODE: EBCS22008	COURSE NAME: PRINCIPLES OF COMPILER DESIGN	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
T/L/ETL : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE:

Thestudents should be made to

- To understand, design and implement a lexical analyzer.
- To understand, design and implement a parser.
- To understand, design intermediate code generation schemes.
- To understand runtime environment and machine independent optimization.

COURSE OUTCOMES (COs): Students will be able to

CO1	To realize basics of compiler design and apply for real time applications. (L1)
CO2	To Introduce different translation languages (L4)
CO3	Ability to understand the importance of code generation and code optimization. (L2)
CO4	To know about compiler generation tools and techniques (L2)
CO5	Design a simple compiler using the construction tools. (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	2	3	2	1	1	2	2	2	2		
CO2	2	2	2	1	2	1	2	2	2	1	1	1
CO3	3	2	3	2	2	2	1	1	1		1	1
CO4	3	3	3	2	3	3	1					
CO5	3	3	3	2	3	2	1					

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	2	3	2	2
CO3	2	2	1	1
CO4	2	1	1	-
CO5	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
EBCS22008	PRINCIPLES OF COMPILER DESIGN	Ty	3	0/0	0/0	3

UNIT I- Introduction: **9 Hrs**

The structure of a compiler, The science of building a compiler, Programming language basics

Lexical Analysis:

The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

UNIT II – Syntax Analysis:9 Hrs

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar, Top-Down Parsing – General Strategies Recursive Descent Parser –FIRST and FOLLOW- -LL(1) grammars- Non Recursive Predictive Parser-Bottom Up Parsing – Shift Reduce Parser-LR Parser-LR (0) Item Construction of SLR Parsing Table -Introduction to LALR Parser – Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT III – Syntax-Directed Translation:9 Hrs

Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation:

Variants of Syntax Trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Switch Statements.

UNIT IV- Run-Time Environments:9 Hrs

Storage Organization- Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

Code Generation:

Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

UNIT V – Machine-Independent Optimization:9 Hrs

The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

Total Hours: 45

TEXT BOOKS: 1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman (2007), Compilers Principles, Techniques and Tools, 2nd edition, Pearson Education, New Delhi, India.

REFERENCE BOOKS:

1. Alfred V. Aho, Jeffrey D. Ullman (2001), Principles of compiler design, Indian student edition, Pearson Education, New Delhi, India.

2. Kenneth C. Louden (1997), Compiler Construction– Principles and Practice, 1st edition, PWS Publishing.

3. K. L. P Mishra, N. Chandrashekaran (2003), Theory of computer science- Automata Languages and computation, 2nd edition, Prentice Hall of India, New Delhi, India.

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBOL22I01	**ONLINECOURSE (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 EBCS22L05	COURSE NAME: NETWORKPROGRAMMINGLAB	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: OPERATING SYSTEMS LAB	Lb	0	0/0	3/0	1

L:LectureT:Tutorial S.Lr:SupervisedLearning P:Project R:ResearchC:Credits
Ty/Lb/ETL/IE:Theory/Lab/EmbeddedTheoryandLab/ Internal Evaluation

OBJECTIVES:

The students should be made to

- HandsonExperiencetodesignanapplicationusingTCP andUDPsockets.
- HandsonExperiencetodesigninterfacetotransferafilebetweentwoendsusingFTP
- HandsonExperiencetodevelopa RMIapplicationforspecificoperation
- TohaveacknowledgetoworkwithNetworkSimulators

COURSEOUTCOMES (COs): Students will be able to

CO1	AbilitytoapplytheknowledgeinSocketProgrammingusingTCP andUDP[L3]
CO2	Design a Client/ServerApplicationProgrambyrememberingthestandardsofprotocol[L6]
CO3	Abilityto createa ServerbasedapplicationusingRMIandRPCconcepts[L6]
CO4	Understandhownetwork stimulatorworks[L2]
CO5	Analyzethestateofnetwork[L4]

MappingofCourseOutcomeswith ProgramOutcomes (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	3
CO3	3	3	3	3
CO4	3	2	2	2
CO5	3	2	3	2

3/2/1IndicatesStrengthOfCorrelation,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
EBCS22L05	NETWORKPROGRAMMING LAB	Lb	0	0/0	3/0	1

LISTOF EXPERMENTS:

1.Networking Commands with options. (Case Study).

2. Socket program to extent communication between two deferent ends using TCP.

3. Socket program to extent communication between two deferent ends using UDP

4. Create a Socket (TCP) between two computers and enable file transfer between them.

5. Design a TCP concurrent server to echo given set of sentences using poll functions

6. Implement Concurrent Time Server application using UDP to execute the program at remote server. Client sends a time request to the server; server sends its system time back to the client. Client displays the result.

7. Implementation of RPC in server-client model

8. Implementation of ARP/RARP.

9. HTTP Socket program to download a web page.

10. File transfer in Client-Server architecture using following methods
    a) Using RS232C b) Using TCP/IP
11. To implement RMI (Remote Method Invocation)

12. Write a network program to broadcast/ multicast a message to a group in the same network.

13. Demonstration of Network Simulators.

Total Hours:45

COURSE CODE: EBCS22L06	COURSE NAME: COMPILER DESIGN LAB	Ty/Lb/ ETL/IE	L	T/ S.Lr	P/R	C
	Prerequisite: Computer Organization and Architecture	Lb	0	0/0	3/0	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:

Thestudents should be made to

- The students will be able to construct the NFA and DFA for a regular expression and implement various phases of compiler.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Implement Symbol table (L5)
CO2	Design a lexical analyzer. (L5)
CO3	Construct the NFA and DFA for a regular expression. (L5)
CO4	Implement the front end and back end of a compiler. (L4)
CO5	Implement different parsing algorithms. (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	2	3	2	3	2	2	1	1	1	1	1
CO2	3	2	3	3	2	2	2	1			1	
CO3	3	3	3	2	2	2	1	1			1	
CO4	3	3	3	3	3	2	2	1		1		
CO5	3	3	3	2	1	2	1	1		1		

COs /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	3	2	1
CO3	2	3	2	1
CO4	3	2	3	2
CO5	3	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
EBCS22L06	COMPILER DESIGN LAB	Lb	0	0/0	3/0	1

LISTOF EXPERMENTS:

1. Implementation of symbol table.
2. Develop a lexical analyzer to recognize a few patterns in c (ex. Identifiers, constants, comments, operators etc.)
3. Design a lexical analyzer for the given language. The lexical analyzer should ignore redundant spaces, tabs and new lines, comments etc.
4. Program to recognize a valid variable which starts with a letter followed by any number of letter or digits.
5. Program to implement NFAs that recognize identifiers, constants, and operators of the mini language.
6. Program to implement DFAs that recognize identifiers, constants, and operators of the mini language.
7. Program to eliminate Left Factoring.
8. Program to Construct top-down parsing table
9. Program for Shift-reduce parsing algorithm
10. Program to Operator-Precedence parsing algorithm
11. Program to Construct LR-Parsing table
12. Program to Generate a code for a given intermediate code
13. Generate Machine code.

Total Hours:45

Course Code	CourseName :	Ty/ Lb/ ETL/IE	L	T/ S.Lr	P/R	C
EBAI22ET3	**INTELLIGENT MULTI AGENT AND EXPERT SYSTEMS**					
	Prerequisite: NIL	ETL	2	0/0	2/0	3

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

OBJECTIVES :

The students should be made to

- Comprehend the concept of agents, intelligent agent systems, design architectures, agent communication, interaction protocols, key types of possible multi-agent system interaction and agreement.
- Comprehend the concept of expert system, expert system architecture, production rules and implementation tools.
- Apply the principles and methods of intelligent multi-agents and expert systems.
- Synthesize multi-agent expert systems to solve small or large scale real life problems.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand intelligent agent systems characteristics and structure of agents.
CO2	Build intelligent agents that can effectively cooperate in order to solve problems.
CO3	Apply the concepts of agent communication,multi-agent interactions and interaction protocols.
CO4	Describe the concept of expert system, models and existing system model.
CO5	Apply the concept of implementation tools and inference.

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	1	3	3	3	2	2
CO2	3	1	2	1	3	3	2	3	1	3	3	1
CO3	2	3	3	2	3	3	2	2	3	2	1	2
CO4	2	3	3	2	3	3	3	2	2	3	3	2
CO5	3	3	2	2	3	2	3	3	3	3	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3
CO2	2	2	2	3
CO3	3	3	3	1
CO4	1	1	2	2
CO5	2	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	L	T/ S.Lr	P/R	C
EBAI22ET3	INTELLIGENT MULTI AGENT AND EXPERT SYSTEMS	ETL	2	0/0	2/0	3

UNIT I INTRODUCTION TO AGENTS **12 Hrs**

Agents-Intelligent Agent :Agents and Objects, Agent and Export system, Agents as International system-Nature of Environment; Architecture for Intelligent agent; Problem solving and Planning: Result sharing, Task sharing and Distributed planning.

UNIT II INTELLIGENT AGENTS **12 Hrs**

Deductive Reasoning Agents: Agents as theorem provers,Agent-oriented programming; Practical reasoning agents-Means-End Reasoning, Implementing a practical reasoning agent, Agents as reactive systems; hybrid agents:TouringMachines,InteRRap,HOMER architecture.

UNIT III AGENTCOMMUNICATIONANDINTERACTIONPROTOCOLS12 Hrs

AgentCommunications:KnowledgeQueryandmanipulationLanguage(KQML),KnowledgeInterchangeFormat(KIF),Ontology, Classifyingmulti-agentinteractions:Multi-agentEncounters-Competitiveandzero-sumandotherinteractions-Cooperation.

UNIT IV INTRODUCTIONTOEXPERTSYSTEM **12 Hrs**

ExpertSystems:Introduction,Application,Merits and Demerits;Conventional system vs. Expert system,Steps to Develop an Expert system,Types of Expert system Technology ,Features of an Expert system,Architecture,Basic Components of an Expert system.

UNIT V EXPERT SYSTEM IMPLEMENTATION **12 Hrs**

Basicformsofinference:abduction;deduction;induction.Rule-basedrepresentations(withbackwardandforwardreasoning)logic-basedrepresentations(withresolutionrefutation), ImplementationTools:Prolog,CLIPS.

Total Hours: 60

TEXT BOOKS

1. Michael Wooldridge, ‑An Introduction to Multi Agent Systems‖,Second Edition, Wiley,2009.
2. G. Weiss (ed.), ‑Multi-Agent Systems - A Modern Approach to Distributed ArtificialIntelligence‖,(2ndEd.).MITPress,2013.
3. Dan W. Patterson, ‑Introduction to AI&Expert System‖, PHI, 2007

REFERENCE BOOKS

1. D. Poole and A. Mackworth, ‑ArtificialIntelligence: Foundations of Computational Agents, Cambridge UniversityPress,2010
2. PeteJackson,"IntroductiontoExpertSystems", 3rdEdn, PearsonEducation, 2007.

COURSE CODE: EBCS22I02	COURSE NAME: TECHNICAL SKILL II	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

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
EBCS22I02	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

VI SEMESTER

COURSE CODE **EBCS22009**	COURSE NAME**:** **OBJECT ORIENTED SOFTWARE ENGINEERING**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: OBJECT ORIENTED PROGRAMMING WITH C++	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 different software life cycle concepts
- Study and design SRS Documents for software projects.
- Use UML Diagrams to express design of a software system
- Understand various testing and maintenance measures

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the key activities in managing Software Development[L2]
CO2	Apply Object-Oriented Design Principles to develop software [L3]
CO3	Apply different Modeling Techniques to model software projects[L3]
CO4	Apply Systematic Procedure for Software Design and Deployment[L3]
CO5	Analyze various testing and maintenance techniques[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**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**2**	**1**	**3**
CO2	**2**	**3**	**2**	**1**	**3**	**3**	**1**	**3**	**2**	**2**	**1**	**3**
CO3	**3**	**2**	**2**	**1**	**3**	**2**	**1**	**3**	**2**	**3**	**1**	**2**
CO4	**3**	**3**	**2**	**1**	**3**	**2**		**3**	**2**	**2**	**1**	**3**
CO5	**3**	**2**	**2**	**1**	**2**	**2**		**3**	**3**	**2**	**1**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**3**	**2**
CO2	**3**	**3**	**3**	**3**
CO3	**2**	**3**	**2**	**2**
CO4	**2**	**2**	**3**	**3**
CO5	**2**	**1**	**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
EBCS22009	OBJECT ORIENTED SOFTWARE ENGINEERING	Ty	3	0/0	0/0	3

UNIT I SOFTWARE DEVELOPMENT LIFE CYCLE AND MODELS 9 Hrs

Introduction – **Software Development Life Cycle:** Requirement Analysis – Designing – Coding – Testing – Deployment – Maintenance – **Software Process Models:** Waterfall Model – Incremental Development – Reuse-oriented Software Engineering – **OOSD Life Cycle:** Object-Oriented Analysis – Object-Oriented Design – Object-Oriented Implementation – **Software Process Activities:** Software Specification – Software design and implementation – Software Validation – Software Evolution – **Object Modeling Techniques –** Rumbaugh Methodology – Booch Methodology – Jacobson Methodology – Agile Methodology – Boehm's Spiral Model.

UNIT II OBJECT ORIENTED SOFTWARE REQUIREMENT ANALYSIS 9 Hrs

Introduction – Software Requirements Specification (SRS) Document – System Functions: Functional and Non-Functional Requirements – **Unified Modeling Language (UML):** Introduction – Classification of UML Diagrams: **Structural UML:** Class Diagram – Object Diagram – Component Diagram – **Behavior UML:** State Diagram – Activity Diagram – Use Case Diagram – Sequence Diagram – **System Modeling:** Context Models – Interaction Models – Structural Models – Behavioral Models.

UNIT III OBJECT ORIENTED SOFTWARE DESIGN 9 Hrs

System Design: System Architectural Design Decisions – Architectural Views – Architectural Patterns **-- Object-Oriented Design:** OO Concepts – OO Design Axioms and Corollaries – Design Patterns – Designing Classes – Designing protocols and class visibility – OO Design using UML – Designing Methods – **Access Layer:** OODBMS – Table Class Mapping – Designing Access Layer Classes – **View Layer:** Designing Interface Objects.

UNIT IV SOFTWARE TESTING 9 Hrs

Introduction –Testing Strategies – Test Cases – Test Plan – **Types of Testing:** Unit Testing – Integration Testing – Development Testing – Object Oriented Testing – User Acceptance Testing – Quality Assurance Testing – Myer's Debugging Principles.

UNIT V SOFTWARE QUALITY MANAGEMENT 9 Hrs

Software Quality – **Software Quality Management:** Quality Assurance – Quality Planning – Quality Control – Benefits Of Software Quality – Best Practices of Software Quality **-Project Management:** Risk Management – Configuration Management – Change Management – Version Management – Release Management.

Total Hours: 45

TEXT BOOK:

1. Yogesh Singh, Ruchika Malhotra (2012), Object-Oriented Software Engineering, PHI Learning Private Limited.

REFERENCES:

1. *Ian Sommerville (2008) Software Engineering (9th ed.) Pearson Education Asia*
2. *Ali Bahrami (2008) Object Oriented System Development McGraw Hill international*
3. *Roger S. Pressman (2010) Software Engineering: A Practitioner Approach (8th ed.) McGraw hill Publications*
4. *Grady Booch (2009) Object oriented Analysis &design ,Pearson Education India*

COURSE CODE: **EBCS22010**	COURSE NAME: **WEB DESIGNING USING PHP / MYSQL**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: JAVA PROGRAMMING	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

- Remember about HTML, CSS3, PHP and XML concepts
- Understand the installation process and work with MySQL database.
- Design the basic and advanced applications using PHP and MySQL.
- Study about the concept of Web services.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Remember the fundamentals of HTML, CSS and PHP[L1]
CO2	Learn the database concepts and MySQL[L1]
CO3	Understand the skills that will enable to design and build high level web enabled applications[L2]
CO4	Apply the concept of the serverside programming to develop the application on web pages[L3]
CO5	Acquaint the latest programming language for the concepts of web services [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	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3	3	2	3
CO3	3	3	3	1	3	2	1	3	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3	3	3
CO5	3	3	3	3	3	2	2	1	3	2	3	3

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	3	3
CO2	3	2	3	3
CO3	3	2	3	3
CO4	3	2	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
EBCS22010	WEB DESIGNING USING PHP / MYSQL	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO HTML AND PHP 9 Hrs

Introduction to Web server and Web browser - HTML – forms – frames – tables – web page design – Dynamic HTML – introduction – cascading style sheets – object model and collections –event model – filters and transition – data binding – data control - Introduction to PHP-- Lexical structure -Variable function, - Manipulating and searching strings-Arrays

UNIT II XML 9 Hrs

Role of XML - XML and the Web - XML Language Basics - Revolutions of XML - Service Oriented Architecture (SOA). XML - Name Spaces - Structuring with Schemas and DTD - Presentation Techniques - Transformation - XML Infrastructure- Overview of SOAP- Introduction to SGML - COM – DCOM – CORBA

UNIT III SERVER SIDE PROGRAMMING 9 Hrs

Introduction to Servlets and Java Server Page (JSP), Servlets lifecycle, Servlet Classes and Sessions.JSP Application Design, JSP objects, sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP.

UNIT IV DATABASES AND GRAPHICS USING PHP 9 Hrs

Using PHP to access Database – Relational Databases and SQL – MySQLi Object interface – SQLite-Direct file level manipulation – mongoDB.Embedding an image in a page – Basic Graphic concepts – Creating and drawing images.

UNIT V WEB SERVICES 9 Hrs

Overview - Architecture - Technologies - UDDI - WSDL - ebXML -. File Handling in PHP-file uploads – file access

Total Hours: 45

TEXT BOOKS:

1. Richard Clark, Oli Studholme, Christopher Murphy and DivyaManian," Beginning HTML5 and CSS 3" @ Apress , 2012.
2. Frank. P. Coyle, "XML, Web Services and The Data Revolution", Pearson Education, 2002.
3. Kevin Tatroe, Peter MacIntyre, etal"Programming PHP" O REILLY 3rd Edition – 2013
4. Luke Welling, Laura Thomson "PHP and MySQL Web Development" Person Education 5th Edition – 2016.

REFERENCE BOOKS:

1. Robin Nixon "Learning PHP, MySQL & JavaScript" O REILLY – 5th Edition - 2015.
2. Laura Lemay, Rafe Coburn, Jennifer Kyrnin, "Mastering HTML, CSS & JavaScript Web Publishing", Pearson Education.2015 Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Education, 2004.

Course Code: **EBAI22002**	Course Name : **NATURAL LANGUAGE PROCESSING CONCEPTS & PRINCIPLES**	**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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES :

The students should be made to

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications

COURSE OUTCOMES (COs) : Students will be able to

CO1	Provide the student with knowledge of various levels of analysis involved in NLP
CO2	Understand the applications of NLP
CO3	Gain knowledge in automated Natural Language Generation and Machine Translation
CO4	Compare and contrast different types of advance database management systems.
CO5	Describe database Administration and its management.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**3**	**2**	**3**	**2**	**1**	**1**	**3**	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**1**	**2**
CO3	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**1**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**2**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**2**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**		
CO1	**3**	**3**	**3**	**3**		
CO2	**3**	**2**	**2**	**2**		
CO3	**3**	**3**	**3**	**3**		
CO4	**3**	**3**	**3**	**3**		
CO5	**3**	**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
EBAI22002	NATURAL LANGUAGE PROCESSING CONCEPTS & PRINCIPLES	Ty	3	0/0	0/0	3

UNIT I- OVERVIEW AND MORPHOLOGY **9 Hrs**

Introduction – Models -and Algorithms - Regular Expressions Basic Regular Expression Patterns – Finite State Automata, Morphology -Inflectional Morphology - Derivational Morphology - Finite-State Morphological Parsing --Porter Stemmer.

UNIT II - WORD LEVEL AND SYNTACTIC ANALYSIS **9 Hrs**

N-grams Models of Syntax - Counting Words - Unsmoothed N- grams- Smoothing- Backoff DeletedInterpolation – Entropy - English Word Classes - Tagsets for English - Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging.

UNIT III –CONTEXT FREE GRAMMARS **9 Hrs**

Context Free Grammars for English Syntax- Context- Free Rules and Trees - Sentence- Level Constructions– Agreement – Sub Categorization - Parsing – Top-down – Earley Parsing - feature Structures – ProbabilisticContext-Free Grammars.

UNIT IV –SEMANTIC ANALYSIS **9 Hrs**

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus - Representing Linguistically Relevant Concepts -Syntax- Driven Semantic Analysis - Semantic Attachments -Syntax- Driven Analyzer - Robust Analysis - Lexemes and Their Senses - Internal Structure - Word SenseDisambiguation -Information Retrieval.

UNIT V –LANGUAGE GENERATION AND DISCOURSE ANALYSIS **9 Hrs**

Discourse -Reference Resolution - Text Coherence - Discourse Structure – Coherence - Dialog and Conversational Agents - Dialog Acts – Interpret ation -Conversational Agents - Language Generation – Architecture - Surface Realizations - Discourse Planning - Machine Translation – Applications of NLP.

Total Hours : 45

TEXT BOOKS

1. Daniel Jurafsky and James H Martin, ”Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Pearson Publication, 2014.
2. C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press. Cambridge, MA:,1999

REFERENCE BOOKS

1. Richard M Reese, ―Natural Language Processing with Java‖, O_Reilly Media, 2015.
2. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

COURSE CODE	COURSE NAME: **OBJECT ORIENTED SOFTWARE ENGINEERING LAB**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
EBCS22L07	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 ApproachL5]
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
EBCS22L07	OBJECT ORIENTED SOFTWARE ENGINEERINGLAB	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: EBCS22L08	**WEB DESIGN USING PHP& MYSQL LAB**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite:C PROGRAMMING AND MS OFFICE TOOLS	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:

The students should be made to

- Develop an own web site.
- Understand the knowledge to design webpage using CSS.
- Gain knowledge to design a dynamic web site
- Develop a form based communication with Databases.

COURSE OUTCOMES (COs): Students will be able to

CO1	Design a webpage using various html tags[L6]
CO2	Remember the functions in PHP[L1]
CO3	Understanding the concept of CSS to develop interactive web pages[L2]
CO4	Able to learn and develop to design form handling[L6]
CO5	Create applications using different types of web services and frameworks[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**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO4	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**3**	**2**
CO2	**3**	**3**	**2**	**2**
CO3	**2**	**3**	**3**	**3**
CO4	**2**	**1**	**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
EBCS22L08	**WEB DESIGNUSING PHP &MYSQL LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**

LISTOF EXPERMENTS:

1. Create a web page which includes the following using HTML
   a) Import an Image,
   b) Include Check box, Radio Button,
   c) Use href tag
2. Create a web page which includes the following using HTML
   a) Create a table,
   b) Include the types of List
   c) Use hover tag
3. Generate the Fibonacci series using PHP user-defined function.
4. Apply any two PHP sort functions each on an indexed array and an associative array.
5. Create a web page with the following using HTML
   i) To embed an image map in a web page
   ii) To fix the hot spots
   iii) Show all the related information when the hot spots are clicked.
6. Create a web page with all types of Cascading style sheets.
7. Client Side Scripts for Validating Web Form Controls using DHTML
8. Form Handling in PHP- Create a recruitment website where a job seeker can upload his/her details (ex naukri)
9. Create an Employee database with two fields Employer's Name, Employee's Name with MySql and insert two records into those fields using PHP code.
10. Develop a webpage using scripting languages with the help of CSS

Total Hours:45

COURSE CODE: EBCS22I07	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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES :

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
EBCS22I07	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: EBCS22I03	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
EBCS22I03	**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: EBAI22I01	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 : 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
EBAI22I01	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: **EBAI22003**	CourseName : **DEEP LEARNING PRINCIPLES**	**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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES :

The students should be made to

- To understand the theoretical foundations, algorithms and methodologies of NeuralNetworks.
- To design and develop an application using specific deep learningmodels.
- To provide the practical knowledge in handling and analyzing real world applications.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Recognize the characteristics of deep learning models that are useful to solve real-worldproblems.
CO2	Understand different methodologies to create application using deepnets.
CO3	Identify and apply appropriate deep learning algorithms for analyzing the data for varietyof problems.
CO4	Implement different deep learningalgorithms
CO5	Design the test procedures to assess the efficacy of the developedmodel.

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	2	2	3	3	3	3
CO2	3	3	3	3	2	3	2	2	3	3	3	3
CO3	3	3	3	3	1	3	2	2	3	2	3	3
CO4	3	3	3	3	2	3	2	2	3	2	3	3
CO5	3	3	3	3	2	3	2	2	3	2	3	3

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	2
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	2	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
EBAI22003	DEEP LEARNING PRINCIPLES	Ty	3	1/0	0/0	4

UNIT I INTRODUCTION TO DEEP LEARNING and MACHINE LEARNING 12Hrs

Introduction to Deep Learning – Difference between Deep Learning and machine learning - Evolution of AI and ML: Historical Epochs - Learning algorithms - Maximum likelihood estimation - Building machine learning algorithm - Neural Networks Multilayer Perceptron - Back-propagation algorithm and its variants.

UNIT II LEARNING IN DEEP NETWORKS 12Hrs

Back propagation training - Representation Learning - Width and Depth of Neural Networks - Activation Functions: RELU, LRELU, ERELU - Unsupervised Training of Neural Networks - Restricted Boltzmann Machines - Auto Encoders - Batch Learning.

UNIT III CONVOLUTIONAL NEURAL NETWORKS 12Hrs

Architectural Overview - Motivation, Layers, Filters - Parameter sharing – Regularization - Popular CNN Architectures: ResNet, AlexNet – Applications.

UNIT IV RECURRENTNETWORKS 12 Hrs

Recurrent Neural Networks - Bidirectional RNNs - Encoder-decoder sequence to sequence architectures - BPTT for training RNN –Deep Recurrent Networks, Auto Encoders.

UNIT V GENERATIVE DEEP LEARNING 12Hrs

LSTMs to synthesize text - Neural Style transfer and applications - Image synthesis with variational auto encoders - Generative Adversarial Networks: What does a GAN look like? – Generator - Discriminator, Generator vs Discriminator - Training GANs.Deep Learning Applications.

Total Hours : 60

TEXT BOOKS

1. Ian Goodfellow, YoshuaBengio and Aaron Courville, " Deep Learning", MIT Press, 2017.
2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
3. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" Apress, 2018.

REFERENCE BOOKS

1. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012.
2. EthemAlpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
3. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
4. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.
5. Francois Chollet "Deep Learning with Python", Manning Publications, 2017.

COURSE CODE	COURSE NAME: **CONNECTED BUSINESS**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
EBCS22013	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 study fundamental concepts of IoT.
- To understand roles of sensors in IoT
- To learn different protocols used for IoT design
- To be familiar with IoT and M2M
- To understand the role of IoT in various domains of Industry.

COURSE OUTCOMES (Cos) : Students will be able to	
CO1	Understand the various concepts, terminologies and architecture of IoT systems.
CO2	Apply sensors and actuators for design of IoT.
CO3	Understand and apply various protocols for design of IoT systems
CO4	Analyze the Difference between IoT and M2M
CO5	Understand APIs to connect IoT related technologies

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**	**2**	**1**	**1**	**2**	**2**	**3**	**2**
CO2	**3**	**2**	**3**	**2**	**1**	**2**	**1**	**3**	**3**	**2**	**3**	**2**
CO3	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**2**
CO4	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**2**
CO5	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**2**	**1**	**2**
CO2	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**
CO5	**3**	**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	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/ S.Lr	P/R	C
EBCS22013	CONNECTED BUSINESS	Ty	3	0/0	0/0	3

UNIT I Introduction of IoT **9 HRS**

Introduction- Characteristics of IoT- Physical & Logical Design of IoT-Enabling Technologies in IoT-IoT Levels and Deployment Templates.

UNIT II Sensors Networks **9 HRS**

Definition-Types of Sensors-Types of Actuators, Examples and Working-IoT Development Boards: Arduino IDE and Board Types-RaspberryPi Development Kit-RFID Principles and components-Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes.

UNIT IIIWireless Technologies for IoT **9 HRS**

WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus-IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT-Edge connectivity and protocols.

UNIT IVIoT and M2M **9 HRS**

Introduction- M2M-Difference between IoT and M2M-SDN and NFV for IoT.

UNIT VApplications of IoT **9HRS**

Home Automation-Smart Cities- Energy- Retail Management- Logistics-Agriculture-Health and Lifestyle-Environment-Energy.

Total Hours: 45

TEXT BOOKS :

1. Vijay Madisetti and ArshdeepBahga, ― "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014.
2. HakimaChaouchi, ― "The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Wiley Publications
3. Olivier Hersent, David Boswarthick, and Omar Elloumi, ― "The Internet of Things: Key Applications and Protocols", WileyPublications
4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.

REFERENCE BOOKS:

1. Daniel Minoli, ― "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

COURSE CODE **EBCS22014**	COURSE NAME**:** **CLOUD COMPUTING**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Computer Networks	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 and Lab/ Internal Evaluation

OBJECTIVES:

The students should be made to

- Identify the technical foundations of cloud systems architectures.
- Analyze the problems and solutions to cloud application problems.
- Apply principles of best practice in cloud application design and management.
- Identify and define technical challenges for cloud applications and assess their importance.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the fundamental principles of cloud computing. [L2]
CO2	Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing. [L2]
CO3	Analyze the performance of Cloud Computing. [L4]
CO4	Learn the Concept of Cloud Infrastructure Model. [L1]
CO5	Understand the concept of Cloud Security. [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**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**3**
CO3	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**3**	**2**	**2**
CO4	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**2**	**3**
CO3	**3**	**3**	**3**	**2**
CO4	**3**	**2**	**3**	**2**
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
EBCS22014	CLOUD COMPUTING	Ty	3	1/0	0/0	4

UNIT I-FOUNDATION **12 Hrs**

Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm

UNIT II-INFRASTRUCTURE AS A SERVICE (IAAS) **12 Hrs**

Virtual Machines Provisioning and Migration Services, On the Management of Virtual Machines for Cloud Infrastructures, Enhancing Cloud Computing Environments Using a Cluster as a Service, Secure Distributed Data Storage in Cloud Computing

UNIT III-PLATFORM AND SOFTWARE AS A SERVICE (PAAS/IAAS) **12 Hrs**

Aneka—Integration of Private and Public Clouds, CometCloud: An Autonomic Cloud Engine, T-Systems' Cloud-Based Solutions for Business Applications, Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments, TheMapReduce Programming Model and Implementations

UNIT IV-MONITORING AND MANAGEMENT **12 Hrs**

An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing: A Service Provider's Perspective, Performance Prediction for HPC on Clouds

UNIT V-APPLICATIONS **12 Hrs**

Best Practices in Architecting Cloud Applications in the AWS Cloud, Massively Multiplayer Online Game Hosting on Cloud Resources, Building Content Delivery Networks Using Clouds, Resource Cloud Mashups

Total Hours: 60

TEXT BOOKS:

1.Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds. *Cloud computing: Principles and paradigms*. John Wiley & Sons, 2010.

REFERENCE BOOKS:

1.Voorsluys, William, James Broberg, and RajkumarBuyya. "Introduction to cloud computing." *Cloud computing: Principles and paradigms* (2011): 1-44.

2.Shawish, Ahmed, and Maria Salama. "Cloud computing: paradigms and technologies." *Inter-cooperative collective intelligence: Techniques and applications*. Springer, Berlin, Heidelberg, 2014. 39-67.

3.Birje, Mahantesh N., et al. "Cloud computing review: concepts, technology, challenges and security." *International Journal of Cloud Computing* 6.1 (2017): 32-57

COURSE CODE **EBAI22004**	COURSE NAME **: ESSENTIALS OF 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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES :

The student 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.
CO2	Apply appropriate supervised learning algorithms to design predictive models to solve any given problem.
CO3	Apply appropriate unsupervised learning algorithms and develop applications for performing clustering and dimensionality reduction.
CO4	Evaluate the solutions for complex problems using artificial neural networks and kernel machines.
CO5	Understand and apply probabilistic graphical models for suitable applications.

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	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
EBAI22004	ESSENTIALS OF MACHINE LEARNING	Ty	3	0/0	0/0	3

UNIT I: FUNDAMENTALS OF 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 AND REINFORCEMENT LEARNING 9 Hrs

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

UNIT IV: EVALUATION METRICS 9 Hrs

ROC Curves, Evaluation Metrics, Significance tests – Perceptron- Error correction in Perceptrons - Multilayer perceptron- Back Propagation – Initialization, Training and Validation Support Vector Machines(SVM) as a linear and non-linear classifier.

UNIT V: MACHINE LEARNING IN PRACTICE 9 Hrs

Data collection – Preprocessing (Missing values, Normalization, Adopting to chosen algorithm etc.,) – Outlier Analysis (Z-Score) - Model selection & evaluation – Optimization of tuning parameters – Setting the environment – Visualization of results.

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”, Packet Publishing, 2015.

COURSE CODE **EBCS22L09**	COURSE NAME**:** **Data Analytics Lab using Machine Learning Algorithms**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Artificial Intelligence	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

- Implement Big Data Analytics Problems

COURSE OUTCOMES (COs): Students will be able to

CO1	Explore the Big Data Platform Hadoop and its Use cases (L4)
CO2	Implement and demonstrate various algorithms using Hadoop (L5)
CO3	Exposure on Big data Analytics problems. (L3)
CO4	Explore and implement Map Reduce Jobs (L4)
CO5	Exposure to Decision Tree based ID3 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	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**1**	**1**	**1**		**1**
CO2	**1**	**3**	**1**	**2**	**3**	**2**	**2**	**1**	**1**	**1**		
CO3	**3**	**2**	**3**	**3**	**3**	**2**	**1**		**1**		**1**	
CO4	**3**	**2**	**3**	**2**	**2**	**2**	**1**					
CO5	**2**	**3**	**2**	**2**	**2**	**2**	**1**					

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**3**	**2**
CO2	**2**	**2**	**2**	**2**
CO3	**3**	**3**	**2**	**1**
CO4	**2**	**1**	**1**	**2**
CO5	**3**	**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
EBCS22L09	**Data Analytics Lab using Machine Learning Algorithms**	Lb	0	0/0	3/0	1

List of Experiments

1. Downloading and installing Hadoop; Understanding different Hadoop modes. Start-up scripts, Configuration files.

2. Hadoop Implementation of file management tasks, such as Adding files and directories, Retrieving files and Deleting files

3. Implement of Matrix Multiplication with Hadoop Map Reduce

4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

5. Implementation of K-means clustering using Map Reduce

6. Implement and demonstrate theFIND-S Algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a CSV file.

7. 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.

8. 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.

9. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

10. 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.

Total Hours:45

COURSE CODE	COURSE NAME: **CLOUD COMPUTING LAB**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
EBCS22L10	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

- Be exposed to tool kits of cloud environment.
- Be familiar with developing web services/Applications in grid framework
- Learn to run virtual machines of different configuration.
- Learn to use Hadoop

COURSE OUTCOMES (COs): Students will be able to

CO1	To learn the design and development process involved in creating a cloud based application[L6]
CO2	To learn to implement and use parallel programming using Hadoop[L3]
CO3	To learn to use virtualization [L1]
CO4	Manipulate large data sets in a parallel environment. [L3]
CO5	Install and use a generic cloud environment that can be used as a private cloud. Install and use a generic cloud environment that can be used as a private cloud. [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**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**3**
CO2	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**3**
CO3	**2**	**2**	**3**	**2**	**3**	**1**	**2**	**1**	**2**	**3**	**2**	**1**
CO4	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**2**
CO5	**3**	**3**	**1**	**2**	**1**	**2**	**2**	**2**	**3**	**1**	**3**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**2**	**3**
CO2	**3**	**2**	**1**	**3**
CO3	**3**	**2**	**2**	**2**
CO4	**1**	**1**	**2**	**1**
CO5	**1**	**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
EBCS22L10	CLOUD COMPUTING LAB	Lb	0	0/0	3/0	1

List of Experiments

1. Install Virtualbox/VMware Workstation with different flavours of linux and windows OS on top of windows7 or 8 or 10.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
8. Install Hadoop single node cluster and run simple applications like word count.

Total Hours:45

COURSE CODE: **EBAI22I02**	COURSE NAME: **PROJECT PHASE - I**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: NIL	IE	3	0/0	0/0	3

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

- 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	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**	**PO12**
CO1	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**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	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**1**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**3**	**3**
CO2	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**
CO4	**2**	**2**	**2**	**2**
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
EBAI22I02	PROJECT PHASE – I	IE	3	0/0	0/0	3

OBJECTIVE:

B. Tech CSE Project carries 12 credits of which,Phase I carries 2 credit.

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

COURSE CODE: **EBFL22IXX**	COURSE NAME: **FOREIGN LANGUAGE**	**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
EBFL22IXX	FOREIGN LANGUAGE	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 speakers of 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	EBFL22I01	FRENCH
2	EBFL22I02	GERMAN
3	EBFL22I03	JAPANESH
4	EBFL22I04	ARABIC
5	EBFL22I05	CHINESE
6	EBFL22I06	RUSSIAN
7	EBFL22I07	SPANISH

Total Hours:45

VIII SEMESTER

COURSE CODE: EBCC22ID2	COURSE NAME: PRINCIPLES OF MANAGEMENT AND BEHAVIORAL SCIENCE	Ty/Lb/ ETL/IE	L	T/S Lr	P/R	C
	Prerequisite: Nil	**ID**	**3**	**0/0**	**0/0**	**3**

L:LectureT:Tutorial SLr:SupervisedLearningP:ProjectR:ResearchC:Credits
T/L/ETL:Theory/Lab./EmbeddedTheoryandLab/Internal Evaluation

OBJECTIVE:

The students should be made to

- About the evolution, functions and principles of Management Studies
- The applications of the principles in an organization
- The system and process of effective controlling in the organization.

COURSEOUTCOMES(COs): Students will be able to

CO1	Clear understanding in planning, and have knowledge in aspect of Management Studies (Level 2)
CO2	Understanding the planning process in the organization. (Level 2)
CO3	Understanding the concept of organization. (Level 2)
CO4	Demonstrate the ability to directing and coordinating. (Level 3)
CO5	Analyze and formulate the best control methods. (Level 4)

MappingofCourseOutcomes(COs)withProgramOutcomes(POs)&ProgramSpecificOutcomes(PSOs)

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

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

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

COURSE CODE: EBCC22ID2	COURSE NAME: PRINCIPLES OF MANAGEMENT AND BEHAVIORAL SCIENCE	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
	Prerequisite: Nil	**ID**	**3**	**0/0**	**0/0**	**3**

UNIT- I INTRODUCTION **9 hours**

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and responsibilities – Evolution of Management –need and Importance of Organizational Behavior, Leadership styles – Theories – Leaders Vs Managers.

UNIT –II PLANNING & ORGANISING **9 hours**

Nature and purpose of planning – planning process – types of planning – Planning premises objectives – hierarchy of objectives, Management By Objectives (MBO)— Decision making process. Nature and purpose of Formal and informal organization structure– types – Line and staff authority– delegation of authority – centralization and decentralization.

UNIT-III STAFFING AND COORDINATING **9 hours**

Human Resource Planning, Job Analysis, Recruitment, Selection, Training and Development, Performance Management, Career planning. Coordination –Nature and purpose - Coordination at various levels: Top management, Middle management, Supervisory management and workers. Techniques for effective coordination

UNIT- IV DIRECTING AND CONTROLING **9 hours**

Direction: Principles of direction – Need and Importance for directing, process of controlling – budgetary and non-budgetary control techniques – use of technology. Recent Trends in Management controlling.

UNIT-V GROUP BEHAVIOUR AND MOTIVATION **9 hours**

Group Dynamics - How Groups Work, Stages of Group Development, Team building, Motivation – Theories of motivation Organizational Conflict – Causes – Types of Conflicts, Managing conflicts.

Total Hours: 45

REFERENCE BOOKS:

1. Stephen A. Robbins & David A. Decenzo& Mary Coulter, “Fundamentals of Management” 7th Edition, Pearson Education,2011.
2. Robert Kreitner& Mamata Mohapatra, “Management”, Biztantra,2008.
3. Harold Koontz & Heinz Weihrich “Essentials of management” Tata Mc Graw Hill,1998.
4. S.S. Khanka - Organizational Behaviour - S. Chand Ltd. – 2006.
5. L.M.Prasad - Organizational Behaviour. S. Chand Company – 3rd edition – 2004.

COURSE CODE: EBAI22L01	COURSE NAME : PROJECT PHASE – II	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite:	Lb	0	0/0	12/12	8

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

- 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
EBAI22L01	**PROJECT PHASE – II**	**Lb**	**0**	**0/0**	**12/12**	**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.

Total Hours:45

ELECTIVE I : GENERAL APPLICATIONS

Course Code: EBAI22E01	Course Name : **BUSINESS 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 : Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

The Students should be made to:

- Be exposed with the basic rudiments of business intelligence system
- Understand the modeling aspects behind Business Intelligence
- Understand the business intelligence life cycle and the techniques used in it
  Be exposed with different data analysis tools and techniques

COURSE OUTCOMES (COs) Students will be able to:

CO1	understand the fundamentals of business intelligence.
CO2	interface data mining with business intelligence.
CO3	apply various modeling techniques.
CO4	analyze the data and knowledge delivery stages.
CO5	understand the emerging technology and visualization

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**2**	**3**	**3**
CO2	**2**	**3**	**3**	**3**
CO3	**2**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**
CO5	**3**	**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	Ty/Lb/ETL/IE	L	T/S.Lr	P/R	C
EBAI22E01	**BUSINESS INTELLIGENCE**	**Ty**	**3**	**0/0**	**0/0**	**3**

UNIT I BUSINESS INTELLIGENCE **9 Hrs**

Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

UNIT II KNOWLEDGE DELIVERY **9 Hrs**

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

UNIT III EFFICIENCY **9 Hrs**

Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

UNIT IV BUSINESS INTELLIGENCE APPLICATIONS **9 Hrs**

Marketing models – Logistic and Production models – Customer Support – Accounting – Human Resources – Operations - Case studies.

UNIT V FUTURE OF BUSINESS INTELLIGENCE **9 Hrs**

Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

Total Hours: 45

TEXT BOOKS:

1. Efraim Turban, Ramesh Sharda, DursunDelen, “Decision Support and Business Intelligence Systems”, 9 th Edition, Pearson 2013.
2. Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of DecisionMaking”, Addison Wesley, 2003.
3. Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009.

REFERENCE BOOKS:

1. David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager‟s Guide”, Second Edition, 2012.
2. Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw-Hill, 2007.
3. Ralph Kimball ,Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, “The Data Warehouse Lifecycle Toolkit”, Wiley Publication Inc.,2007

Course Code: **EBAI22E02**	Course Name : **COGNITIVE SYSTEMS**	**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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES

The Students should be made to:

1. To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.
2. To demonstrate and apply the principal aspects of cognitive science,methods and paradigms
3. To get the detailed about appealing new cognitive model for application development.
4. To understand how cognitive computing supports human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers

COURSE OUTCOMES (COs) : Students will be able to:

CO1	Understand and discuss cognitive computing and differs from traditional approaches.
CO2	Apply the primary techniques and tools associated with cognitive computing
CO3	Understand and discuss the cognitive development stages and review existing frameworks for modeling memory and language
CO4	Design the simulation models of cognition using different cognitive architectures/models for real-world applications
CO5	Understand and discuss cognitivecomputing, and traditional approaches.

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**	**1**	**2**	**3**	**-**	**-**	**1**	**1**	**1**	**-**	**1**
CO2	**3**	**2**	**3**	**2**	**3**	**1`**	**1**	**2**	**1**	**3**	**2**	**1**
CO3	**3**	**2**	**2**	**2**	**3**	**2**	**1**	**3**	**2**	**2**	**2**	**1**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**2**	**1**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**3**	**2**	**1**	**2**	**2**	**1**	**1**	**3**

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

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ETL/IE	L	T/ S.Lr	P/R	C
EBAI22E02	**COGNITIVE SYSTEMS**	**Ty**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION TO COGNITIVE SYSTEMS 9 HRS

The Nature of Cognition, Overview, Four Aspects of modeling cognitive systems. Levels of abstraction in modeling cognitive systems - Marr‘s hierarchy of abstraction, Kelso‘s hierarchy of abstraction. Paradigms of Cognitive Science- cognitivist paradigm, emergent paradigm.

UNIT II COGNITIVE ARCHITECTURE 9 HRS

The cognitivist perspective, The emergent perspective- Desirable characteristics: Realism, Behavioural characteristics, Cognitive characteristics, Functional capabilities, Development, Dynamics - Anatomy – Types of Anatomy - Embodiment and Its Implications, Cognitive architectures such as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks, DeepQA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge.

UNIT III MODELING PARADIGMS 9 HRS

Declarative/ logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition.

UNIT IV MODELING ASPECTS OF COGNITION 9 HRS

Classical models of rationality, symbolic reasoning and decision making; Formal models of inductive generalization, causality, categorization and similarity; the role of analogy in problem solving.

UNIT V COGNITIVE MODELS OF MEMORY AND LANGUAGE 9 HRS

Memory–Types of memory, Computational models: episodic and semantic memory, modeling psycholinguistics (with emphasis on lexical semantics), modeling the interaction of language, memory and learning

TOTAL HOURS:45

TEXT BOOKS:

1.Vernon, David, Artificial Cognitive Systems: A Primer, (The MIT Press) 1st Edition, 2015.
2.The Cambridge Handbook of Computational Psychology, Ron Sun (ed.), Cambridge University Press (2008)

REFERENCE BOOKS:

1.Dawson, M.R.W. (2013) Mind, Body, World: Foundations of Cognitive Science. Athabasca University Press: Edmonton
2.Peter Finger, Cognitive Computing: A Brief Guide for Game Changers, Meghan Kiffler Press, 1st Edition, 2015, ISBN: 973-0-92965251-1
3.Kai Hwang, Cloud Computing for Machine Learning and Cognitive Applications, MIT Press Publishers, June 2017 | ISBN: 9780262341110
4.Jay Friedenberg, Gordon Silverman, Cognitive Science, An Introduction to the Study of Mind, SAGE Publications, Inc, THIRD EDITION

Course Code : EBAI22E03	Course Name **:** **INTELLIGENT ROBOTICS AND DRONE TECHNOLOGY**	**Ty/Lb/ETL/ IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite:	Ty	3	0/0	0/0	3

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

OBJECTIVES

The Students should be made to:

1.To understand the cognitive of Robotics
2.To understand the design principle of Robotics.
3.To realize the design principles and its applications of Undammed Ariel Vehicle.

COURSE OUTCOMES (COs) : Students will be able to

CO1	understand the cognitive (vision, motor control, language, social skills) robots and their driving requirements (engineering operations, navigation, cooperation)
CO2	understand advanced methods for creating highly capable cognitive robots.
CO3	explore the new Drone Technology.
CO4	understand various design models in drone technologies
CO5	explore advanced features and assembly technologies

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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
EBAI22E03	INTELLIGENT ROBOTICS AND DRONE TECHNOLOGY	Ty	3	0/0	0/0	3

UNIT I INTELLIGENT SYSTEM DESIGN AND COGNITION DEVELOPMENT 9 Hrs

Thinking, Cognition, and Intelligence, Defining Intelligence - Embodiment and Its Implications, Synthetic Methodology for Intelligence. Model of Cognition, Visual Perception, Visual Recognition, Machine Learning, and Robot Cognition.

UNIT IICOGNITION DEVELOPMENT CONTROL 9 Hrs

Properties of Complete Agents, Agent Design Principle, Developmental Robot Design, Matching brain and , Body Dynamics, Artificial Neural Networks (ANN), Fuzzy Logic, Genetic Algorithms and Other Nature Inspired Methods, Optimal Control using ANN. Introduction, Constructing a 2D World Map, Data Structure for Map Building, Explanation of the Algorithm, An Illustration of Procedure Map Building.

Unit III SIMULTANEOUS LOCALISATION AND MAPPING 9 Hrs

Problem Definition, Mathematical Basis, Examples: SLAM in Landmark Worlds, Taxonomy of the SLAM Problem, Extended Kalman filter, Graph-Based Optimization Techniques, Particle Methods Relation of Paradigms. Python Robot Programming Methods-:Go-to-Goal Behaviour, Avoid-Obstacles Behaviour, Hybrid Automata , _ (Behaviour State Machine),Follow-Wall Behaviour. A Complete Program for autonomous mobile robot.

Unit IV UNMANNED ARIEL VEHICLE 9 Hrs

Unmanned Ariel vehicle- Typical physical parameter , Categories of UAV , Law and Deployment restriction on UAV, small UAV , Civil and Military application of UAV. Drone- motor , frame , sensors , speed controller , Flight control board, Radio transmitter and receiver , Battery , propellers , connectors.

Unit V DRONE ASSEMBLY 9 Hrs

Drone assembly - Quad copter - Design Models- Auto pilot models ,Kinematic model of controlled flights , Instamatic guidance model , Dynamic guidance model.

Total Hours: 45

TEXT BOOKS:

1. David Vernon, “Artificial Cognitive Systems: A Primer”, The MIT Press.
2. Patnaik, Srikanta, “Robot Cognition and Navigation – An experiment with Mobile Robots”, Springer Verlag Berlin and Heidelberg, 2007.
3. Howie Choset, Kevin LynchSeth Hutchinson, George Kantor, Wolfram Burgard, Lydia Kavradi and Sebastian Thrun, “Principles of Robot Motion – Theory, Algorithms and Implemenation”, MIT Press, Cambridge, 2005.

REFERENCE BOOKS:

1. A.R.Jha .Theory , Design and Application of UAV 1st Ed 2016.
2. Syed Omer Faruk Towaha , Building Smart Drones with ESP8266 and Arduino Packt Publishing 2018.

Course Code EBAI22E04	Course Name REINFORCEMENT LEARNING	Ty/Lb/ETL/ IE	L	T/SLr	P/R	C
	Prerequisite : None	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/ Internal Evaluation

OBJECTIVES

The Students should be made to:

- To understand the main concepts related to reinforcement learning
- To review real-world applications of reinforcement learning
- To apply reinforcement learning to solve real-life problems

COURSE OUTCOMES (Cos) : Students will be able to

CO1	understand the key features of reinforcement learning (RL) that distinguishes it from AI and non-interactive machine learning
CO2	analysis the application problem should be formulated as a RL problem and state what algorithm is best suited for addressing it
CO3	implement in code common RL algorithms
CO4	apply and perform case study related to reinforcement learning.
CO5	understand about Deep reinforcement learning

Mapping of Course Outcome with Program Outcome (POs)

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

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1
CO2	2	2	1	2
CO3	2	2	1	2
CO4	2	2	2	2
CO5	3	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/SLr	P/R	C
EBAI22E04	**REINFORCEMENT LEARNING**	Ty	3	0/0	0/0	3

UNIT:1 INTRODUCTION 9 HRS

Reinforcement learning, Examples, Elements of reinforcement learning, An extended example: Tic-Tac-Toe, Limitations and Scope

UNIT :2 TABULAR SOLUTION METHODS 9 HRS

Multi-armed bandits, Gradient Bandit algorithms, Finite Markov Decision Processes, Optimal Policies and Optimal Value Functions, Dynamic Programming and its efficiency, Monte Carlo methods, Monte Carlo Prediction

UNIT :3 PLANNING AND LEARNING WITH TABULAR METHODS 9 HRS

Models and Planning, Dyna: Integrated Planning, Acting, and Learning, Trajectory Sampling, Real-time Dynamic Programming, Planning at Decision Time, Heuristic Search, Rollout Algorithms, Monte Carlo Tree Search

UNIT :4 APPLICATIONS AND CASE STUDIES RELATED TO REINFORCEMENT LEARNING 9 HRS

TD-Gammon, Samuel‘s Checkers Player, Watson‘s Daily-Double Wagering, Optimizing Memory Control, Human-level Video Game Play, Mastering the Game of Go, Personalized Web Services, Thermal Soaring, Reinforcement learning in robotics

UNIT : 5 DEEP REINFORCEMENT LEARNING 9 HRS

Introduction to Deep Learning, Deep Q-Learning, Value-based Deep RL: Deep Q-network, Policy-based Deep RL: REINFORCE, Asynchronous Methods for Deep RL: Advantage Actor- Critic (A2C), Model-based Deep RL

TOTAL HOURS : 45

TEXT BOOKS

1.Reinforcement Learning: An Introduction (Adaptive Computation and Machine Learning series) 2nd edition, Richard S. Sutton and Andrew G. Barto, A Bradford Book; 2018, ISBN 978-0262039246.

REFERENCE BOOKS

1.Reinforcement Learning Algorithms: Analysis and Applications, Belousov, B., Abdulsamad, H., Klink, P., Parisi, S., Peters, J. (Eds.), Studies in Computational Intelligence Series, Vol. 883, Springer 2021, ISBN 978-3-030-41187-9
2. Reinforcement Learning: Industrial Applications of Intelligent Agents , Phil Winder, O'Reilly.2020, ISBN: 9781098114831
3. Learning to Play: Reinforcement Learning and Games, Aske Plaat, Springer 2020, ISBN 978-3-030-59237-0
4.Applied Reinforcement Learning with Python WithOpenAI Gym, Tensorflow, and Keras, TawehBeysolow, Apress, 2019, ISBN 978-1-4842-5126-3

ELECTIVE – II : HEALTH CARE

Course Code	Course Name :	Ty/Lb/ETL/ IE	L	T/SLr	P/R	C
EBAI22E05	**MACHINE INTELLIGENCE FOR MEDICAL IMAGE ANALYSIS**					
	Prerequisite : None	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/ Internal Evaluation

OBJECTIVES

The Students should be made to:

- Apply the Basic concepts in Algebra
- Use the Basic concepts in Matrices
- Identify and solve problems in 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	Understand the summation of the given series of binomial, exponential & logarithmic
CO2	Transform a non – diagonal matrix into an equivalent diagonal matrix using orthogonal transformation.
CO3	Analyze the expansion of trigonometric function into an infinite series and to separate a complex function into real and imaginary parts.
CO4	Apply knowledge and concepts in finding the derivative of given function and to find the maxima / minima of the given function.
CO5	Evaluate the partial / total differentiation and maxima / minima of a function of several variables.

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	1	1	2	2	-	1	1	1	1	1
CO2	3	3	1	2	3	1	-	2	1	2	2	1
CO3	3	3	2	2	3	2	-	2	2	3	2	1
CO4	3	3	2	2	1	2	1	3	2	2	1	2
CO5	3	3	2	2	2	2	1	1	-	2	2	2

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

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

Category	Basic Science	Engineering Science	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/ SLr	P/R	C
EBAI22E05	MACHINE INTELLIGENCE FOR MEDICAL IMAGE ANALYSIS	Ty	3	0/0	0/0	3

UNIT 1 FUNDAMENTALS OF MEDICAL IMAGE PROCESSING 9 HRS

Principles of Image Formation – Coordinate System: Body – Scanner – Scene – Structure – Display; Image Enhancement using Histogram Processing – Noise Suppression: Image Filtering: Gaussian Filtering – Median Filtering – Unsharp Masking– Adaptive Filtering Edge Detection-
Image Quality Metrics – Image Artifacts – Linear Filtering – Convolution and Correlation- Algorithms to remove noise

UNIT 2 SEGMENTATION AND MORPHOLOGICAL OPERATIONS 9 HRS

Image Segmentation – Region Based – Edge Based – Morphological Operations – Dilation –
Erosion – Chain code – Feature Extraction

UNIT 3 RADIOGRAPHY AND MAGNETIC RESONANCE IMAGING 9 HRS

X-rays; interaction of x-ray beam with tissue; X-ray detectors; X-ray detectors in CT; Data acquisition in CT; image reconstruction; spiral CT – MRI - Image acquisition and reconstruction; interaction with tissue; slice selection; basic pulse sequences; 3D-imaging; fast imaging methods;
functional imaging

UNIT 4 ULTRASONIC IMAGING 9 HRS

Physics of acoustic waves propagation in tissues; generation and detection of ultrasound; B-mode;
M-mode; TM-mode processing; date acquisition.- Types of noise – Noise Removal

UNIT 5 MACHINE INTELLIGENCE 9 HRS

Data labelling – Feature Computation and selection – The learning process – Neuronal algorithms: Bayes Classifier, Linear Classifier, Decision trees , Random forests, Neural networks to diagnose a wide variety of medical conditions such as screening for common cancers- classify tumors in PET images — Automated CT Scanners - Deep learning architectures for segmentation – U-Net

TOTAL HOURS : 45

TEXT BOOKS

1. Biomedical Image Analysis, Rangaraj M. Rangayyan, 2004

REFERENCE BOOKS

1. Medical Image Analysis, A. Dhawan, Wiley 2003
2. Foundations of Medical Imaging, Cho, Jones, Singh, John Wiley & Sons, 1993
3. Fundamentals of Medical Imaging, Paul Suetens, Cambridge University, 2nd edition, 2009
4. Deep Learning for Medical Image Analysis, S. Kevin Zhou, Hayit Greenspan, Dinggang Shen, Academic Press, ISBN: 9780128104095, 2017

Course Code: **EBAI22E06**	Course Name **BIOINFORMATICS**	**Ty/Lb/ETL/ IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite:	**Ty**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVES

The Students should be made to:

- To study the scope of Bioinformatics
- To understand the types of Databases and their uses
- To analyze the Tools and Algorithms
- To learn the Pair wise Sequence Alignment methods

COURSE OUTCOMES (COs) : Students will be able to

CO1	understand the concepts of Bioinformatics
CO2	recall the basic concepts of database
CO3	Illustrate various tools and techniques used for Bioinfomatics.
CO4	apply the algorithm of bioinformatics
CO5	understand the concepts of Genome analysis and sequence

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**	**1**	**2**	**3**	**1**	**2**	**1**				
CO2	**3**	**2**	**3**	**2**	**3**	**2**	**1**	**1**	**2**	**1**		**1**
CO3	**3**	**2**	**2**	**2**	**3**	**2**	**1**		**1**	**2**	**2**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**2**	**2**		**2**	**2**	**2**	**2**
CO5	**3**	**3**	**2**	**2**	**3**	**2**	**1**	**1**	**1**	**2**	**3**	**1**

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

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 NAME	Ty/Lb/ETL/ IE	L	T/ S.Lr	P/R	C
EBAI22E06	BIOINFORMATICS	Ty	3	0/0	0/0	3

UNIT I- INTRODUCTION **9 HRS**

Introduction-Historical Overview and Definition- Bioinformatics ApplicationsMajor Databases in Bioinformatics- Data Management and Analysis- Molecular Biology and Bioinformatics- Central Dogma of Molecular Biology

UNIT II--DATABASES **9 HRS**

Introduction- Characteristics of Bioinformatics Databases- Categories of Bioinformatics Databases- Navigating databases- Sequence DatabasesNucleotide sequence database- secondary Nucleotide sequence database – protein sequence databases- structure databases- Structure file formats- Protein Structure Database Collaboration- PDB- CATH –SCOP- Other databases- Enzyme Databases- MEROPS- Pathway Databases:CAZy

UNIT III – TOOLS **9 HRS**

Introduction- Need for Tools- Knowledge Discovery- Data- Mining Tools- Data Submission tools- Nucleotide Sequence Submission and Protein Submission tools- Data Analysis tools- Prediction Tools- Phylogenetic trees and Phylogenetic Analysis- Modelling Tools

UNIT IV- ALGORITHMS **9 HRS**

Introduction- Classification of Algorithms- Biological Algorithms- Implementing Algorithms- Biological Algorithms- Bioinformatics Tasks and Corresponding Algorithms- Data Analysis Algorithms- Sequence Comparison Algorithms – Substitution Matrices Algorithms –Sequence Alignment Optimal Algorithms- 215 CS-Engg&Tech-SRM-2013 Prediction Algorithms- Phylogenetic prediction Algorithm – Protein Structure Prediction

UNIT V –GENOME ANALYSIS AND SEQUENCE ALIGNMENT **9 HRS**

Introduction- Genome Analysis- Genome mapping- The Sequence Assembly Problem- Genome Sequencing- Biological Motivation of Alignment ProblemsMethods of Sequence Alignments- Using Scoring matrices- Measuring Sequence Detection Efficiency- Working with FASTA and BLAST

TOTAL HOURS : 45

TEXT BOOKS

1. OrpitaBosu, SimminderKaurThukral , “Bioinformatics: Database, Tools, Algorithms”, Oxford University Press, Chennai, 2007.
2. Rastogi S. C., NamitaMendiratta, Parag Rastogi, “Bioinformatics: Methods and Applications: Genomics, Proteomics and Drug Discovery”, Third Edition, PHI Learning Pvt. Ltd., New Delhi, 2011.

REFERENCE BOOKS

1. Bryan Bergeron, “Bioinformatics computing”, PHI Learning Pvt. Ltd, New Delhi, 2010.
2.Rastogi S.C., NamitaMendiratta, Parag Rastogi, “Bioinformatics: Concepts”, Skills & Applications, Second Edition, CBS Publishers & Distributors Pvt. Ltd, 2009
3. Arthur M. Lesk, “Introduction to Bioinformatics”, Third Edition, Oxford University Press, Chennai, 2010
4. Gautham N., “Bioinformatics:Databases and Algorithms”, Alpha Science 2006

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBAI22E07	**INTELLIGENT EMBEDDED SYSTEMS**	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/ Internal Evaluation

OBJECTIVES

The Students should be made to:

- To understand principles and algorithms for prototyping embedded systems with high level of deduction and adaptation.
- To provide students with holistic view
- Detailed knowledge of hardware – software co-design of intelligent, real-time embedded systems

COURSE OUTCOMES (Cos) Students will be able to

CO1	understanding of the fundamental design paradigms, architectures, possibilities and challenges for embedded systems from both hardware and software perspective
CO2	evaluate the methodological knowledge of the development of intelligent embedded systems
CO3	examine the capable of using recent methods and tools
CO4	analyze various intelligent embedded system design in the areas of health care.
CO5	analyze various intelligent embedded system design in the areas of Medical Applications.

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**	**1**	**2**	**3**	**1**	**1**	**3**	**2**	**1**		
CO2	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**2**	**1**	**1**		**2**
CO3	**3**	**2**	**2**	**2**	**3**	**2**	**1**	**3**	**2**	**2**	**1**	**2**
CO4	**3**	**3**	**3**	**2**	**3**	**2**	**1**	**2**	**2**	**2**	**1**	**3**
CO5	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**1**	**2**	**2**

COs/PSOs	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**2**	**2**	**2**
CO2	**3**	**1**	**1**	**3**
CO3	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**2**	**2**
CO5	**3**	**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/SLr	P/R	C
EBAI22E07	Intelligent Embedded Systems	Ty	3	0/0	0/0	3

UNIT I FUNDAMENTALS OF EMBEDDED SYSTEM 9 Hrs

Core of the embedded system, Memory, Sensors (resistive, optical, position, thermal) and Actuators (solenoid valves, relay/switch, opto-couplers), Communication Interface, Embedded firmware (RTOS, Drivers, Application programs), Power-supply (Battery technology, Solar), PCB and Passive components, Safety and reliability, environmental issues. Ethical practice. Characteristics and quality attributes (Design Metric) of embedded system. Real time system‘s requirements, real time issues, interrupt latency.

UNIT II EMBEDDED SYSTEM INTERFACING 9 Hrs

Introduction to ARM-v7-M (Cortex-M3), ARM-v7-R(CortexR4) and comparison between them. Embedded System Interfacing-Study of basic communication protocols like SPI, SCI (RS232, RS485), I2C, CAN, Field-bus (Profibus), USB (v2.0), Bluetooth, Zig-Bee, Wireless sensor network.

UNIT III LEARNING IN EMBEDDED SYSTEMS 9 Hrs

Introduction, From Metrology to Digital Data, Uncertainty; Information and Learning Mechanisms, Randomized Algorithms, Robustness Analysis , Embedded C-programming concepts (from embedded system point of view): Optimizing for Speed/Memory needs, Interrupt service routines, macros, functions, modifiers, data types, device drivers, Multithreading programming. Basic embedded C programs/applications for ARM-v7, using ARM-GCC-tool-chain, Emulation of ARM-v7 (e.g. using QEMU), and Linux porting on ARM-v7 (emulation) board.

UNIT IV INTRODUCTION TO EMBEDDED SYSTEMS IN HEALTH CARE DOMAIN 9 Hrs

Embedded System in Bio-medical applications: Criticality, Reactivity, Autonomy; Trends in medical systems: Ambient Intelligence, Assistive technologies for procedures, In-Body devices, Treating Machines, Monitoring/Imaging Systems, VR enhanced Reality systems.

UNIT V EMBEDDED SYSTEMS AND MEDICAL APPLICATIONS 9 Hrs

Managing Chronic conditions, Wellness Management, Clinical Support, Specific Embedded Architectures with grid service architectures, Privacy and Security Issues, Hybrid Electronic and biological systems : Informatics and biologically active – augmentation with genetic data.

Total Hours: 45

TEXT BOOKS:

1. Introduction to Embedded Systems, Shibu K. V. TMH Publications, 2009.
2. Embedded System Design –A unified hardware and software introduction, Frank Vahid, Tony D. Givargis, John Wiley Publications, 2000.
3. U-Healthcare Monitoring Systems: Volume 1: Design and Applications, Nilanjan Dey, ISBN-13: 978-0128153703, Academic Press Publication, 2018.

REFERENCE BOOKS :

1. Internet of Things and Big Data Technologies for Next Generation Healthcare, Chintan Bhatt, Nilanjan Dey, Amira S Ashour, Springer Publication, 2017.
2. Embedded microcontroller and processor design, Charles Greg Osborn,Pearson Publication, 2010
3. Embedded Microcomputer Systems –Real Time Interfacing –Jonathan W. Valvano; Cengage Learning; Third edition, CENGAGE Learning Publication, 2012

Course Code: **EBAI22E08**	Course Name : **COMPUTER VISION**	**Ty/ Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite:	**Ty**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVES :

The Students should be made to:

- Understand the fundamentals of image processing techniques.
- Know the concept of computer vision foundations and applications
- To provide Image formation and pre-processing techniques.
- To know the applications of Computer Vision in healthcare.

COURSE OUTCOMES (COs) : Students will be able to	
CO1	implement fundamental image processing techniques required for computer vision
CO2	examine the Image formation and Pre-processing
CO3	implement object recognition,vision and motion related techniques
CO4	understand about 3D vision
CO5	apply computer vision in health care

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**	**1**	**2**	**3**	**3**			**1**			
CO2	**3**	**2**	**3**	**2**	**3**	**3**		**1**	**1**	**2**	**1**	**1**
CO3	**3**	**2**	**2**	**2**	**3**	**3**	**1**		**2**	**2**	**1**	**2**
CO4	**3**	**3**	**3**	**2**	**3**	**3**		**1**	**2**	**3**		**2**
CO5	**3**	**3**	**2**	**2**	**3**	**3**	**1**	**1**		**1**		**1**

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

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 NAME	Ty/Lb/ETL /IE	L	T/SLr	P/R	C
EBAI22E08	COMPUTER VISION	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO COMPUTER VISION 9 Hrs

Brief history of Computer Vision–Image Processing, Machine Learning– Information Retrieval – Neuroscience–Robotics–Speech–Cognitive Sciences – Graphics, Algorithms, Systems and Theory– Pattern Recognition– Computer Graphics.

UNIT II COMPUTER VISION FOUNDATIONS 9 Hrs

Image Processing- Colour-Linear Algebra Primer- Pixels and Filters- Edge Detection-Features and Fitting-Feature Descriptors-Image Resizing-Segmentation-Semantic Segmentation - Clustering - Object recognition - Dimensionality Reduction - Face Identification -Visual Bag of Words-Object Detection from Deformable Parts-Semantic Hierarchies and Fine Grained Recognition -Motion-Tracking-Deep Learning

UNIT III IMAGE FORMATION 9 Hrs

Geometric primitives and transformations – Photometric image formation–The digital camera–Point operators–Linear Filtering–More neighbourhood operators–Fourier transforms–Pyramids and wavelets – Geometric transformations –Global optimization

UNIT IV 3D VISION 9 Hrs

Methods for 3D Vision-3D reconstruction–Image based rendering, Image Recognition–Object Detection–Space, Instance and Category Recognition–Recognition Databases and test sets.

UNIT V COMPUTER VISION FOR ASSISTING HEALTHCARE APPLICATIONS 9 Hrs

Computer Vision to see-Computer Vision for Cognition-Computer Vision for physical habilitation and training - Computer Vision for CAD systems in surgery - Computer Vision for human-machine interaction-Computer Vision for Ambient Assisted Living-Ego centric (first person) vision.

TEXT BOOKS

1. RanjayKrishna,"ComputerVision:FoundationsandApplications",StandfordUniversity, December2017.
2. Richard Szeliski,―Computer Vision: Algorithms and Applications, Springer 2011

REFERENCE BOOKS

1. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.
2. Forsyth DA and Ponce J,―Computer Vision: A Modern Approach, Prentice Hall 2003
3. Mark Nixon and AlbertoS. Aquado,―Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press,2012.

ELECTIVE III – IoT

Course Code: **EBAI22E09**	Course Name : **IOT FOR SMART APPLICATIONS**	**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 : Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES

The Students should be made to:

- Be exposed with the basic rudiments of business intelligence system
- Understand the modeling aspects behind Business Intelligence
- Understand the business intelligence life cycle and the techniques used in it
- Be exposed with different data analysis tools and techniques

COURSE OUTCOMES (COs) : Students will be able to

CO1	understand Internet of things and its hardware and software components
CO2	differentiate various interface I/O devices, Sensors & communication modules
CO3	apply various remotely monitor data and control devices
CO4	design and develop real life IoT based projects
CO5	analysis various real case studies related to industrial and hospital problems

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	1	1	1	1						
CO2	3	3	3	2	2	1		1	1	1	1	1
CO3	2	2	2	2	3	1				1	2	1
CO4	2	2	2	2	3	3	1	2	1	-	3	1
CO5	3	2	3	2	3	3	1	2	1	1	1	-

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	2	2
CO2	2	-	2	2
CO3	2	3	2	3
CO4	3	3	2	3
CO5	3	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	Ty/Lb/ETL/ IE	L	T/ S.Lr	P/R	C
EBAI22E09	IOT FOR SMART APPLICATIONS	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO IOT 9 Hrs

Architectural overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2 Mand IoT Technology Fundamentals - Devices and gateways, Data management, Business processes in IoT, Role of cloud in IoT

UNIT II ELEMENTS OF IOT 9 Hrs

Hardware components – computing (Arduino, Raspberry Pi), communication, Sensing, Actuation, I/O interfaces Software Components Programming APIs (Using python /Arduino) for communication protocols - MQTT, Zigbee, Bluetooth, CoAP, UDP, TCP..

UNIT III SENSING ANDACTUATION 9 Hrs

Definition of Sensor, Sensor features, Resolution, Classes, Different types of sensors, Actuator, Different types of Actuators, purpose of Sensors and Actuators in IoT

UNIT IV IOT APPLICATION DEVELOPMENT 9 Hrs

Solution frame work for IoT Applications-Implementation of Device integration, Data acquisition and Integration, Device data storage on cloud/local server, Authentication, authorization of Devices.

UNIT V IOT CASE STUDIES 9 Hrs

IoT Case studies and mini projects based on industrial Automation, Transportation, Agriculture, Healthcare, Home Automation.

TOTAL HOURS: 45 HRS

TEXT BOOK:

1.Vijay Madisetti, Arshdeep Bahga, Internet of Things,"A handson Approach", University Press Second Edition,2012.

REFERENCEBOOKS:

1. Dr SRN Reddy, Rachit Thukraland Manasi Mishra," Introduction to Internet of Things": A practical Approach" ETI Labs.

2. Raj Kamal," Internet of Things: Architecture and Design", McGrawHill

Course Code: **EBAI22E10**	Course Name : **PREDICTIVE ANALYTICS AND IOT**	**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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES

The Students should be made to:

- The course will help to apply machine learning concepts to the IoT data
- Choose appropriate machine learning models for analyzing IoT applications
- To integrate the deep learning scenario to the predictive models
- To visualize IoT data and identify target variables using appropriate algorithms

COURSE OUTCOMES (COs) : Students will be able to

CO1	understand various protocols and communication models used in IoT
CO2	understand the data analysis concept related to IoT
CO3	analysis various knowledge of the platforms used for cloud data
CO4	understand the Big Data technologies and to apply analytics concepts to Industrial problems
CO5	design a dashboard for data visualization and performing analysis for geo-spatial databases

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	1	1	1	1	1			1		
CO2	3	3	3	2	2	1	2			1		
CO3	2	2	2	2	3	1	2			2		
CO4	2	2	2	2	3	3	1			1		
CO5	3	2	3	2	3	3				1		

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1		2	2	2
CO2	2		2	2
CO3		3	2	3
CO4		3	2	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	Ty/Lb/ETL/ IE	L	T/ S.Lr	P/R	C
EBAI22E10	PREDICTIVE ANALYTICS AND IOT	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION 9 Hrs

Introduction to IoT - Definitions, frameworks and key technologies. Challenges to solve in IoT - Key hardware and software elements. Applications: smart transportation, smart cities, smart living, smart energy, smart health, and smart learning. Real-World Data representation and visualization

UNIT II IOT ANALYTICS 9 Hrs

IoT Analytics - Definition, Challenges, Devices, Connectivity protocols, data messaging protocols- MQTT, HTTP, CoAP, Data Distribution Services (DDS), IoT Data Analytics – Elastics Analytics Concepts, Scaling.

UNIT III CLOUD ANALYTICS AND SECURITY 9 Hrs

Cloud Analytics and Security, AWS / Azure / ThingWorx. Design of data processing for analytics, application of big data technology to storage, Exploring and visualizing data, solution for industry specific analysis problem.

UNIT IV VISUALIZATION AND DASHBOARD 9 Hrs

Designing visual analysis for IoT data- creating dashboard –creating and visualizing alerts – basics of geo-spatial analytics- vector based methods-raster based methods- storage of geo-spatial data - processing of geo spatial data- Anomaly detection forecasting. case study: pollution reporting problem.

UNIT V DATA SCIENCE FOR IOT ANALYTICS 9 Hrs

Definition – Feature Engineering with IOT data – Validation methods – Understanding the bias variance tradeoff – Deep Learning

TOTAL HOURS: 45 HRS

TEXT BOOKS

1. Analytics for Internet of Things – Andrew Minteer – Packt Publications Mumbai 2017
2. Big–Data Analytics for Cloud, IoT and Cognitive Computing Hardcover –by Kai Hwang (Author), Min Chen (Author).

REFERENCE BOOKSS

1. Vijay Madisetti and ArshdeepBahga, “Internet of Things: A Hands-on Approach”, Hardcover – Import, 2014.

Course Code: **EBAI22E11**	Course Name : **SMART PRODUCT DEVELOPMENT**	**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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES

The Students should be made to:

1. To learn the fundamentals of Product development and its processes.
2. To understand the how smart system processes and its functional elements
3. To learn the mapping for smart systems in Industry 4.0
4. To design & develop a Knowledge base for Experts Systems
5. To apply Smart Product Development across multidisciplinary Engineering

COURSE OUTCOMES (COs) : Students will be able to

CO1	understand the processes in product design & development
CO2	examine the key elements in smart product technologies in Industry
CO3	understand the integration of knowledge based smart systems
CO4	understand the existing smart systems and products in the industry
CO5	design and develop a Smart Expert System

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	1	1	1	1	1	-	1	2	-	-
CO2	3	3	3	2	2	1	2	-	2	2	1	1
CO3	2	2	2	2	3	1	3	1	2	1	2	1
CO4	2	2	2	2	3	3	3	-	2	2	2	2
CO5	3	2	3	2	3	3	3	1	2	2	1	2

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	-	2	2	2
CO2	2	-	2	2
CO3	2	3	2	3
CO4	3	3	2	3
CO5	3	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	Ty/Lb/ ETL/IE	L	T/ S.Lr	P/R	C
EBAI22E11	SMART PRODUCT DEVELOPMENT	Ty	3	0/0	0/0	3

UNIT I PRODUCT DEVELOPMENT PROCESSES 9Hrs

Product Development Life Cycle, Process Models- Prototyping-Agile Models New Product Development Processes – Knowledge based / driven development – Principal Issues and Challenges.

UNIT II SMART PROCESS ELEMENTS 9Hrs

User and Customer Research–User observation–Customer interviews Competitor landscape, Cost Analysis–Product tear down-Analysis input mapping, Concept generation–Analysis wrap up–idea generation-idea evaluation-concept formulation, Prototype Testing.

UNIT III SMART TECHNOLOGIES IN INDUSTRY 4.0 9Hrs

Cloud Services, Big data & Analytics, Engineering Simulation, 3D printing, Additive Manufacturing.

UNIT IV KNOWLEDGE BASED SYSTEM DEVELOPMENT 9Hrs

Knowledge Discovery, Knowledge Representation, Knowledge Catalogue, Knowledge Graphs, Knowledge Visualization.

UNIT V DESIGN OF AN EXPERT SYSTEM 9 Hrs

Expert System Architectures, An analysis of some classic expert systems–WATSON, Deep expert systems, Co-operating expert systems and the black board model

TOTAL HOURS: 45 Hrs

TEXT BOOKS

1. SmartProductDesign,SendpointsPublications,2017
2. GregaJakus, Veljko Milutinovic, SanidaOmerovic, SasoTomazic, ―Concepts, Ontologies, and Knowledge Representation, Springer, 2013

REFERENCE BOOKS

1. Ronald J. Brachman and Hector J.Levesque,―Knowledge representation and reasoning, 2nd edition, Elsevier publications, 2004.
2. Simon Kendal, Malcolm Creen, ―An Introduction to Knowledge Engineering, Springer, ISBN-13:978-1846284755, 2007

Course Code: **EBAI22E12**	Course Name : **EVENT PROCESSING AND CORRELATION SYSTEMS**	**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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES

The Students should be made to:

1. Explore event processing and correlation techniques.
2. Understanding the building blocks of event processing
3. Gain experience using tools and common processes in event processing

COURSE OUTCOMES (COs) : Students will be able to

CO1	understand the building blocks and basic principles of event processing
CO2	examine various the event patterns for inference, optimization and further analysis of forthcoming patterns
CO3	evaluate the event streams and event stream processing
CO4	analyze the Complex Event Processing design patterns

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	1	1	1	1	-	-	-	2	-	2
CO2	3	3	3	2	2	2	-	-	-	1	-	2
CO3	2	2	2	2	3	2	1	1	1	2	1	1
CO4	2	2	2	2	3	2	1	1	1	2	1	1
CO5	3	2	3	2	3	2	1	1	2	1	1	2

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	-	2	2	2
CO2	2	-	2	2
CO3	-	3	2	3
CO4	-	3	2	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	Ty/Lb/ETL/ IE	L	T/ S.Lr	P/R	C
EBAI22E12	EVENT PROCESSING AND CORRELATION SYSTEMS	Ty	3	0/0	0/0	3

UNIT I THE BASICS AND PRINCIPLES OF EVENT PROCESSING 9Hrs

Event-driven behavior and event driven computing, Introduction to event processing, The business value of an event processing platform, Principles of event processing, Events and event-based programming, Main concepts of event processing.

UNIT II THE BUILDING BLOCKS 9Hrs

Defining the events, Event types, Header and Payload Attributes, Event representation in practice, Producing the events Event producer: concept and definition element, The various kinds of event producers, Consuming the events, Event consumer: concept and definition element, The various kinds of event consumers, Interfacing with event consumers

UNIT III EVENT PROCESSING AND PRAGMATICS 9 Hrs

The event processing network, Event processing agents, Event channels, Global state elements, Putting event sin context, Temporal context, Spatial context, Filtering and transformation, Examples, Detecting event patterns, Event processing programming in practice, Non-functional properties, Performance objectives, Optimization types, Event processing validation and
auditing

UNIT IV EVENT STREAMS AND UNIFIED LOGS 9Hrs

Introducing event streams, Exploring familiar event streams, Unifying continuous event streams,
Introducing use cases for the unified log: anatomy of an unified log, setting up of an unified log

UNIT V EVENT STREAM PROCESSING 9Hrs

Event stream processing with Apache Kafka, Designing a stream- processing app, Writing a simple Kafka worker, Writing a single- event processor

TOTAL HOURS: 45 HRS

TEXT BOOKS

1. Smart Product Design, Send points Publications,2017
2. GregaJakus, Veljko Milutinovic, SanidaOmerovic, SasoTomazic, ―Concepts, Ontologies, and Knowledge Representation, Springer, 2013

REFERENCE BOOKS

1. Ronald J. Brachman and Hector J.Levesque,―Knowledge representation and reasoning, 2nd edition, Elsevier publications, 2004.
2. Simon Kendal, Malcolm Creen, ―An Introduction to Knowledge Engineering, Springer, ISBN-13:978-1846284755, 2007

Course Code: **EBAI22E13**	Course Name : **AI FOR CYBER SECURITY**	**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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES

The Students should be made to:

- To learn the need of AI for Cyber Security
- To learn the detection of DDOS using AI techniques
- To learn the intrusion detection using Neural Networks
- To learn the various applications of AI to detect cyber attacks

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the cyber threats, attacks and vulnerabilities and its defensive mechanism
CO2	Understand and implement various AI techniques to detect cyber attacks
CO3	Examine recent challenges in AI related to cyber security and able to develop new security solutions to the real time applications
CO4	Analysis various CAPTCHA with neural network and Bugs
CO5	Design various Hybrid Intrusion and web based elements.

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**	**1**	**1**	**2**	**-**	**-**	**1**	**-**	**-**	**2**
CO2	**1**	**3**	**2**	**3**	**2**	**1**	**1**	**-**	**1**	**1**	**-**	**1**
CO3	**2**	**3**	**3**	**2**	**3**	**2**	**-**	**1**	**2**	**2**	**1**	**2**
CO4	**2**	**2**	**2**	**2**	**2**	**2**	**-**	**2**	**1**	**2**	**1**	**2**
CO5	**3**	**2**	**2**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**1**	**1**
CO2	**3**	**2**	**3**	**2**
CO3	**2**	**3**	**2**	**3**
CO4	**1**	**2**	**3**	**1**
CO5	**3**	**1**	**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
EBAI22E13	AI FOR CYBER SECURITY	Ty	3	0/0	0/0	3

UNIT I FUNDAMENTALS OF AI **9 Hrs**

Introduction – Problems that AI Solves – Why AI in Cyber security – Current Cyber Security Solutions - Structured data, Unstructured data – Supervised learning – Unsupervised learning – Reinforcement learning – classification problem - clustering problems – SVM – ANNs.

UNIT II AI AND DDOS **9 Hrs**

Time series – Types of Time series – Time Series analysis in Cyber Security – Detecting DDOS with Time Series – Predicting DDOS attacks – Ensemble Techniques for Cyber security – Types of Ensemble – Types of Ensemble Algorithms – Bagging, Boosting, Stacking, Bayesian Model - Ensemble Method to detect Cyber attack.

UNIT III Detection of malicious web pages, URLs **9 Hrs**

URL Blacklisting – Drive by download URL- Command and Control URLs – Phishing URLs – Using Heuristics to detect Malicious Pages – Data for the analysis – Feature Extraction – Lexical Features –Web Content based Features – Host based features – site Popularity features.

UNIT IV CAPTCHA AND SCAN DETECTION & CONTEXT BASED MALICIOUS EVENT DETECTION **9 Hrs**

Using AI to crack CAPTCHA – Types of CAPTCHA – ReCAPTCHA – Breaking a CAPTCHA – Solving CAPTCHA with neural network - Machine Learning in Scan Detection - Machine-Learning Applications in Scan Detection. Context based Malicious event detection – Adware – Bots –Bugs – Ransomeware – Rootkit –Spyware – Trojan horses – Viruses – Worms – Malicious Injections in Wireless networks.

UNIT V AI AND IDS, AI AND MAIL SERVER **9 Hrs**

Architecture of IDS based on Neural networks – Intelligent flow based IDS - Multi-Agent IDS – AI based Ensemble IDS – Machine Learning in Hybrid Intrusion Detection Systems – Machine Learning - Applications in Hybrid Intrusion Detection: Anomaly - Misuse Sequence Detection System – Parallel Detection System.Types of Mail Server – Data Collection from mail server – Naive Bayes theorem to detect spam – Laplace smoothing – Featurization Techniques to covert text based emails to numeric values

Total Hours: 45

TEXT BOOKS

1. Hands-On Machine Learning for Cyber Security: Safeguard your system by making your machine intelligence using the python ecosystem, Soma Harder, Sinan Ozdemir, Packt Publishing Ltd, 2018.
2. The state of the Art in Intrusion Detection System, AI-Sakib Khan Pathan, CRC Press, Taylor

REFERENCE BOOKS

1. Cyber Security for Dummies, Brian Underdahl, Wiley, 2011
2. Cryptography and Network security, Behrouz A. Forouzan ,Debdeep Mukhopadhyay, Mcgraw Hill Education, 2nd Edition, 2011

Course Code:	Course Name :**CYBER THREAT INTELLIGENCE**	**Ty/Lb/ETL/ IE**	**L**	**T/ S.Lr**	**P/R**	**C**
EBAI22E14	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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES

The students should be made to

- Develop analysis skills to better comprehend, synthesize, and leverage complex scenarios
- Identify and create intelligence requirements through practices such as threat modeling
- Understand and develop skills in tactical, operational, and strategic-level threat intelligence
- Generate threat intelligence to detect, respond to, and defeat focused and targeted threats

COURSE OUTCOMES (COs) : Students will be able to

CO1	understanding Intelligence, Intelligence Lexicon
CO2	design various threat intelligence to detect, respond to, and defeat focused and targeted threats
CO3	differentiate various sources to collect adversary data and how to exploit and pivot off of those data
CO4	validate information received externally to minimize the costs of bad intelligence
CO5	analysis various structured analytical techniques to be successful in any security role

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**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**1**	**3**	**2**	**3**	**2**	**1**	**1**	**2**	**1**	**-**	**-**	**2**
CO3	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**2**	**1**	**2**
CO4	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**
CO5	**3**	**2**	**2**	**3**	**2**	**1**	**1**	**3**	**1**	**1**	**-**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**1**	**1**
CO2	**3**	**2**	**3**	**2**
CO3	**2**	**3**	**2**	**3**
CO4	**1**	**2**	**3**	**1**
CO5	**3**	**1**	**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
EBAI22E14	CYBER THREAT INTELLIGENCE	Ty	3	0/0	0/0	3

UNIT I **9 Hrs**

Understanding Intelligence- Intelligence Lexicon and Definitions- Traditional Intelligence Cycle Richards Heuer- Jr.- Sherman Kent- and Intelligence Tradecraft-Structured Analytical Techniques

UNIT II **9 Hrs**

Understanding Cyber Threat Intelligence, Defining Threats, Understanding Risk, Cyber Threat Intelligence and Its Role, Expectation of Organizations and Analysts, Diamond Model and Activity Groups, Four Types of Threat Detection

UNIT III **9 Hrs**

Threat Intelligence Consumption, Sliding Scale of Cyber security -Consuming Intelligence for Different Goals- Enabling Other Teams with Intelligence

UNIT IV **9 Hrs**

Positioning the Team to Generate Intelligence, Building an Intelligence Team, Positioning the Team in the Organization, Prerequisites for Intelligence Generation

UNIT V AI AND IDS, AI AND MAIL SERVER **9 Hrs**

Architecture of IDS based on Neural networks – Intelligent flow based IDS - Multi-Agent IDS – AI based Ensemble IDS – Machine Learning in Hybrid Intrusion Detection Systems – Machine Learning - Applications in Hybrid Intrusion Detection: Anomaly - Misuse Sequence Detection System – Parallel Detection System.Types of Mail Server – Data Collection from mail server – Naive Bayes theorem to detect spam – Laplace smoothing – Featurization Techniques to covert text based emails to numeric values

Total Hours: 45

TEXT BOOKS:

1. Hands-On Machine Learning for Cyber Security: Safeguard your system by making your machine intelligence using the python ecosystem, Soma Harder, Sinan Ozdemir, Packt Publishing Ltd, 2018.
2. The state of the Art in Intrusion Detection System, AI-Sakib Khan Pathan, CRC Press, Taylor

REFERENCE BOOKS:

1.Cyber Security for Dummies, Brian Underdahl, Wiley, 2011
2. Cryptography and Network security, Behrouz A. Forouzan ,Debdeep Mukhopadhyay, Mcgraw Hill Education, 2nd Edition, 2011

Course Code **EBAI22E15**	Course Name **: AI IN BLOCKCHAIN**	**Ty/Lb/ETL/ IE**	**L**	**T/ S.Lr**	**P/ R**	**C**
	Prerequisite: Cryptography and Network Security	Ty	3	0/0	0/0	3

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

OBJECTIVES :

The student should be made to:

- To understand the history, types and applications of Blockchain
- To acquire knowledge about cryptography and consensus algorithms
- get familiarity with future currencies and to create own crypto token

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the functional/operational aspects of Block chain
CO2	Analyze the different Consensus Mechanisms
CO3	Understand the different crypto currency domains
CO4	Understand and Apply the emerging abstract models for Block chain Technology.
CO5	Design and analyze the applications based on Block chain Technology

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO 12**
CO1	**2**	**2**	**1**	**1**	**1**	**2**	**-**	**-**		**2**	**1**	**1**
CO2	**1**	**3**	**2**	**3**	**2**	**1**	**2**	**1**		**1**	**2**	**2**
CO3	**2**	**3**	**3**	**2**	**3**	**2**	**1**	**-**		**2**	**3**	**1**
CO4	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**		**2**	**3**	**2**
CO5	**1**	**2**	**2**	**3**	**2**	**1**	**1**	**1**		**1**	**3**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**1**	**1**	**1**
CO2	**3**	**2**	**2**	**2**
CO3	**2**	**2**	**3**	**2**
CO4	**3**	**3**	**2**	**2**
CO5	**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	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
EBAI22E15	AI IN BLOCKCHAIN	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION 9 Hrs

Defining Blockchain and Distributed Ledger, Blockchain Properties Decentralized, Transparent, Immutable and secure. Blockchain Applications. Types of Blockchain: Public, private, and consortium based blockchain, Whento use, and when not to use Blockchain, History of Blockchain., Peer to Peer Network, P2P network for blockchain

UNIT II BLOCKCHAIN DATA STRUCTURE,CHARACTERISTICS AND CONSENSUS MECHANISMS 9 Hrs

Cryptographic Hash Functions, Digital Signatures, Public Keys as Identities, Hash Pointers and Hash chain and Merkel tree, Consensus mechanisms--Decentralized Identity management, Transactions, incentivising and mining. Distributed Consensus (PoW),.-Proof of storage, proof of stake**,** proof of deposit, proof of burn, proof of activity. algorithms for adjusting difficulty and retargeting.

UNIT III BIT COIN 9 Hrs

Cryptocurrency as the first blockchain application. Mechanics of Bitcoin, Bitcoin Scripts, Storing and Using Bitcoins, Mining in Bitcoin hardness of mining - transaction verifiability - anonymity - forks - double spendingSmart Contracts and Ethereum History, Purpose and types of smart contracts, Introduction to Ethereum, consensus in Ethereum, scripts in Ethereum, Smart contracts (Ethereum Virtual Machine). Developing and executing smart contracts in Ethereum.

UNIT IV PRIVATE AND CONSORTIUM BASED BLOCKCHAIN: HYPERLEDGER 9 Hrs

Need for the consortium. Hyperledger stack, Multichainblockchain. Innovation in Hyperledger, smart contracts, and distributed applications in hyperledgerCase studies/ Enabling Technologies and applications- Application of blockchain in privacy and security, IoT and smart cities, Business and Industry, Data management, e-Governance.

UNIT V AI IN BLOCKCHAIN 9 Hrs

The Blockchain as a Path to Artificial Intelligence, data collection, cleaning, and processing in AI modelling, The Applications of Blockchain in Artificial Intelligence Smart Contract Advocates on Behalf of Digital Intelligence, Hyperledger.**TOTAL HOURS : 45 Hrs**

TEXT BOOKS

1. Andreas M. Antonopoulos and Dr. Gavin Wood "Mastering Ethereum Building Smart Contracts and DApps " O"Reilly, Copyright 2019
2. Melanie Swan , "Blockchain: Blueprint for a New Economy " Copyright 2015 Melanie Swan
3. Imran Bashir," Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks "
4. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, first edition – 2012

REFERENCE BOOKS

1. Ritesh Modi, "Solidity Programming Essentials: A Beginner"s Guide to Build Smart Contracts for Ethereum and Block Chain", Packt Publishing
2.The Applications of Blockchain in Artificial Intelligence,Security and Communication Networks, 2021, 1-16 - September 2021.

Course Code:	Course Name : MALWARE ANALYSIS IN DATA SCIENCE	Ty/Lb/ETL/ IE	L	T/ S.Lr	P/ R	C
EBAI22E16	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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES

The student should be made to:

- To understand and analyse malware using static and dynamic analysis
- To observe malware behaviour
- To build and analyse Malware Networks
- To identify adversary groups through shared code analysis
- To catch vulnerabilities by building your own machine learning detector

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understanding Intelligence, Intelligence Lexicon
CO2	Examine various threat intelligence to detect, respond to, and defeat focused and targeted threats
CO3	Examine different sources to collect adversary data and how to exploit and pivot off of those data
CO4	Analysis various information received externally to minimize the costs of bad intelligence
CO5	Analysis various structured analytical techniques to be successful in any security role

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	3	3	3	1	-	-	-	-	-	2
CO2	2	3	3	3	2	2	-	1	-	1	-	3
CO3	1	2	2	1	1	3	1	-	1	1	1	2
CO4	2	3	2	3	2	2	2	1	1	-	1	1
CO5	3	3	3	3	3	1	1	1	2	-	2	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	2	3	3
CO2	2	2	2	2
CO3	3	1	2	1
CO4	3	2	1	2
CO5	3	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
EBAI22E16	MALWARE ANALYSIS IN DATA SCIENCE	Ty	3	0/0	0/0	3

UNIT I BASIC STATIC MALWARE ANALYSIS 9 Hrs

Static Analysis Definition - Microsoft Windows PE format – Dissecting PE format using PE file – Examining Malware images – Strings – Factors that Limit Static Analysis Introduction to Dynamic Analysis: Why use Dynamic Analysis – Dynamic analysis for data science – Basic tools for dynamic analysis – Limitation of basic dynamic analysis.

UNIT II IDENTIFYING ATTACK CAMPAIGNS USING MALWARE NETWORKS 9 Hrs

Bipartite Networks – Building and Visualizing Malware Networks – Building a shared image relationship network.

UNIT III SHARED CODE ANALYSIS 9 Hrs

Samples comparisons by extracting features – Jaccard Index to quantify similarity – Evaluate Malware Shared Code estimation methods – Building a Similarity Graph –Persistent Malware Similarity Search System

UNIT IV MACHINE LEARNING BASED MALWARE DETECTORS 9 Hrs

: Steps for building detector – Understanding Feature Spaces and Decision Boundaries – Overfitting and Underfitting – Major Types of Machine Learning Algorithms: Logistic Regression – K-Nearest Neighbors – Decision Trees – Random Forest - Toy Decision Tree based Detector – Real World Learning Detectors with sklearn – Industrial Strength Detector Evaluating Malware Detection System - Four possible Detection Outcomes – Considering base rates in evaluation- Evaluating the Detector‘s performance.

UNIT V AI AND IDS, AI AND MAIL SERVER 9 Hrs

Visualizing Malware Trends: Understanding our Malware Dataset – Using matplot lib to visualize data – Using sea born to visualize Data.

Total Hours: 45

TEXT BOOKS:

1. Malware Data Science – Attack Detection and Attribution , Joshua Saxe and Hillary Sanders, No Starch Press, 2018.

REFERENCE BOOKS:

1. Machine Learning and Security: Protecting Systems with Data and Algorithms, Clarence Chio, David Freeman, 1st Edition, O‘Reilly Media, Feb 2018.
2. Mastering Malware Analysis: The complete malware analyst's guide to combating malicious software, APT, cybercrime, and IoT attacks, Alexey Kleymenov, Amr Thabet, 1st Edition, Packt publishing, 2019.
4. Practical Malware Analysis, Michael Sikorski, Andrew Honig, No Starch Press, 2011

Dr.M.G.R. Educational and Research Institute (Deemed to be University)
Department of Computer Science and Engineering
2022 Regulation

ELECTIVE V : SPEECH & VISION

Course Code: **EBAI22E17**	Course Name : **HUMAN MACHINE INTERACTION**	**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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES :

The students should be made to:

- To stress the importance of a good interface design.
- To understand the importance of human psychology in designing good interfaces.

To evaluate applications of human machine interaction ensemble methods in the gaming domains modeling into a cohesive, interactive game application.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Apply key concepts related to HMI in their day to day activities
CO2	Design and conduct experiments, as well as to analyze and interpret data examine various HMI methods used in gaming
CO3	Determine various Interaction, Interface of HMI methods in Gaming
CO4	Understand various web URLS and CMN-GOMS
CO5	Analysis various HCI gaming design elements

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**	**3**	**3**	**3**	**1**	**-**	**-**	**-**	**1**	**-**	
CO2	**2**	**3**	**3**	**3**	**2**	**2**	**-**	**1**	**-**	**2**	**2**	**2**
CO3	**1**	**2**	**2**	**1**	**1**	**3**	**1**	**-**	**1**	**2**	**2**	**2**
CO4	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**1**	**2**	**1**	**2**	**1**
CO5	**3**	**3**	**3**	**3**	**3**	**1**	**1**	**1**	**2**	**1**	**2**	**1**

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

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	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

COURSE CODE	COURSE NAME	Ty/Lb/ETL/ IE	L	T/ S.Lr	P/R	C
EBAI22E17	HUMAN MACHINE INTERACTION	Ty	3	0/0	0/0	3

UNIT I HCI FOUNDATIONS **9 Hrs**

Input–output channels, Human memory, Thinking: reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems, Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction.

UNIT II DESIGNING INTERACTION **9 Hrs**

Shneideman's eight golden rules, Norman's Seven principles, Screen Design -Visual Display Layout, Information Structuring and Navigation, HCI in Software process, Design Rules, HCI for Users with Disability, Mobile devices, Earcon design for aural interface

UNIT III DETECTION OF MALICIOUS WEB PAGES, URLS **9 Hrs**

Model Human Processor - Working Memory, Long-Term Memory, Processor Timing, Keyboard Level Model - Operators, Encoding Methods, Heuristics for M Operator Placement, What the Keyboard Level Model Does Not Model, Application of the Keyboard Level Model, GOMS - CMN-GOMS Analysis, Modeling Structure, State Transition Networks

UNIT IV INTERFACE IN HCI **9 Hrs**

Visual Interface, Emotion in HCI, knowledge driven in HCI, Multi-user Interaction, Interface Selection Options, Wire-Framing.

UNIT V APPLYING HCI IN GAME DESIGN **9 Hrs**

Introduction to game development life cycle, Key issues of HCI in gaming, Game interface design goal, Basic design principles, method of presenting game user interface, Game design documents and storyboarding.

Total Hours: 45

TEXT BOOKS:

1. Gerard Jounghyun Kim, Human Computer Interaction – Fundamentals and Practice, – CRC press, 2015.
2. Regina Bernhaupt , Game User Experience Evaluation-2015 Edition, Kindle Edition
3. Martin Helander, Handbook of Human-Computer Interaction-1988 Elsevier

REFERENCE BOOKS:

1. Julie A. Jacko, The Human–Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications, 3rd Edition, CRC Press (Taylor & Francis Group)
2012.
2. Ben Shneiderman, Catherine Plaisant, Maxine Cohen,Steven Jacobs, Designing the User Interface: Strategies for Effective Human Computer Interaction, 5th Edition, Pearson, 2009.
3. Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale, Human - Computer Interactio3rd Edition, Pearson, 2003.
4.The Encyclopedia of Human-Computer Interaction, 2nd Ed. nteraction Design Foundation
5.MyounghoonJeon ,Emotions and Affect in Human actors and Human–Computer Interaction-2017Academic Press
6.Kevin mullet, Darvel sano, Designing Visual Interfaces: Communication Oriented Techniques,Englewood Cliffs, NJ : SunSoft Press

Course Code: EBAI22E18	Course Name : **SPEECH PROCESSING**	**Ty/Lb/ETL/ IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite:	**Ty**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVES :

The students should be made to

- Tounderstandthefundamentalsofthespeechprocessing
- Explorethevariousspeech models
- Gather knowledgeaboutthephoneticsandpronunciationprocessing
- Performwaveletanalysisofspeech
- Tounderstandtheconceptsofspeechrecognition.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Recall the basic concepts of speech and language processing.
CO2	Illustrate various speech modeling techniques.
CO3	Apply the knowledge of speech pronunciation and signal processing.
CO4	Analyze the problems in speech processing.
CO5	Identify the solution to the speech recognition.

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**	**1**	**2**	**3**	**3**	**1**	**2**	**3**	**3**	**2**	**3**
CO2	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**3**
CO3	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**2**	**3**	**3**	**2**	**3**
CO5	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**3**

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

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

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/ S.Lr	P/R	C
EBAI22E18	SPEECH PROCESSING	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION 9Hrs

Introduction - knowledge in speech and language processing - ambiguity - models and algorithms - language - thought - understanding - regular expression and automata - words& transducers – N grams

UNIT II SPEECH MODELLING 9Hrs

Word classes and part of speech tagging – hidden markov model – computing likelihood: the forward algorithm – training hidden markov model – maximum entropy model – transformation-based tagging – evaluation and error analysis – issues in part of speech tagging – noisy channel model for spelling

UNIT III SPEECH PRONUNCIATION AND SIGNAL PROCESSING 9Hrs

Phonetics - speech sounds and phonetic transcription - articulatory phonetics - phonological categories and pronunciation variation - acoustic phonetics and signals - phonetic resources - articulatory and gestural phonology

UNIT IV SPEECH IDENTIFICATION 9Hrs

Speech synthesis - text normalization - phonetic analysis - prosodic analysis – diphone waveform synthesis - unit selection waveform synthesis – evaluation

UNIT V SPEECH RECOGNITION 9Hrs

Automatic speech recognition - architecture - applying hidden markov model - feature extraction: mfcc vectors - computing acoustic likelihoods - search and decoding - embedded training - multipass decoding: n-best lists and lattices- a* (_stack‘) decoding -context-dependent acoustic models: triphones - discriminative training - speech recognition by humans.

TOTALHOURS :45 Hrs

TEXT BOOKS:

1. DanielJurafskyandJamesH.Martin, ―SpeechandLanguageProcessing:AnIntroductiontoNatural Language Processing, Computational Linguistics and Speech Recognition‖, Personeducation,2013

REFERENCE BOOKS:

1. KaiFuLee,―Automatic Speech Recognition,The Springer International Series in Engineering and Computer Science,1999
2. Himanshu Chaurasiya,―Soft Computing Implementation of Automatic Speech Recognition‖, LAPLambert Academic Publishing,2010
3. Claudio Becchetti, Klucio PrinaRicotti,―Speech Recognition:Theory and C++ implementation, Wiley publications2008.
4. Ikrami Eldirawy, Wesam Ashour,―Visual Speech Recognition ,Wiley publications, 2011

Course Code: EBAI22E19	Course Name : GAME PROGRAMMING	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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES

The students should be made to

- To familiarize with the process of game design and development
- To learn the processes, mechanics, issues in game design
- To understand the architecture of game programming
- To know about game engine development, modeling, techniques and frameworks

COURSE OUTCOMES (COs) : Students will be able to

CO1	Develop game programming skills in various gaming models.
CO2	Create various interactive games
CO3	Apply various applications of Game Theory in Computer Science and Engineering
CO4	Understands various Game Design Principles
CO5	Design approach to various Game Development

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	3	-	-	-	-	1	-	2
CO2	3	3	3	3	3	-	-	1	1	2	-	1
CO3	3	2	2	2	3	1	-	-	2	3	1	2
CO4	3	3	2	2	2	1	1	1	2	2	1	2
CO5	3	2	3	2	2	2	1	1	2	2	2	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	2	3	2
CO3	2	2	3	3
CO4	3	3	3	2
CO5	3	2	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	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

COURSE CODE	COURSE NAME	Ty/Lb/ETL/ IE	L	T/ S.Lr	P/R	C
EBAI22E19	GAME PROGRAMMING	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION **9 Hrs**

Elements of Game Play – Artificial Intelligence – Getting Input from the Player – Sprite Programming – Sprite Animation - Multithreading – Importance of Game Design – Game Loop.

UNIT II 3D GRAPHICS FOR GAME PROGRAMMING **9 Hrs**

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces.

UNIT III GAME DESIGN PRINCIPLES **9 Hrs**

Character Development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding, Case study : Tetris.

UNIT IV GAMING ENGINE DESIGN **9 Hrs**

Renderers, Software Rendering, Hardware Rendering, and Controller Based Animation, Spatial Sorting, Level of Detail, Collision Detection, Standard Objects, and Physics, Case study : The Sims

UNIT V GAME DEVELOPMENT **9 Hrs**

Developing 2D and 3D Interactive Games Using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle Games, Single Player Games, Multi-Player Games. Case study: Mine craft.

Total Hours: 45

TEXT BOOKS:

1. David H. Eberly, ―3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics‖, Second Edition, Morgan Kaufmann, 2010.

2. Jung Hyun Han, ―3D Graphics for Game Programming‖, First Edition, Chapman and Hall/CRC, 2011.

REFERENCE BOOKS:

1 Jonathan S. Harbour, ―Beginning Game Programming‖, Course Technology, Third Edition PTR, 2009.

2. Ernest Adams and Andrew Rollings, ―Fundamentals of Game Design‖, Third Edition, Pearson Education, 2014.

3. Scott Rogers, ―Level Up: The Guide to Great Video Game Design‖, First Edition, Wiley, 2010.

4. Jim Thompson, Barnaby Berbank-Green, and NicCusworth, ―Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game Designer‖, First Edition, Wiley, 2008.

Course Code:	Course Name :	Ty/Lb/ETL/ IE	L	T/ S.Lr	P/R	C
EBAI22E20	**IMAGE & VIDEO PROCESSING**					
	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 : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVES

The students should be made to

- Toprovidethebasicunderstandingofthedigitalimageformationandvisualization.
- Toprovidethevisualizationofrelationshipsbetweenspatialandfrequency.
- Toprovidetheunderstandingofmappingthesignalprocessingtechniquestothedigitalimage.
- Toprovideanideaofmultimediadata(image,video).
- Toprovideanexposuretovariousimageandvideocompressionstandards

COURSE OUTCOMES (COs) : Students will be able to

CO1	Comprehend the image processing fundamentals and enhancement techniques in spatial and frequency domain.
CO2	Describe the color image fundamentals, models and various restoration techniques
CO3	Design and Analyze the image compression systems.
CO4	Outline the various image segmentation and morphology operations.
CO5	Comprehend the basics of video processing and video coding.

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	3	3	3	1	-	-	-	-	1	-
CO2	2	3	3	3	2	2	-	1	-	2	2	2
CO3	1	2	2	1	1	3	1	-	1	2	2	2
CO4	2	3	2	3	2	2	1	1	2	1	2	1
CO5	3	3	3	3	3	1	1	1	2	1	2	1

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

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	Practical / Project	Internships / Technical Skill	Soft Skills				
					✓								

COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/ S.Lr	P/R	C
EBAI22E20	IMAGE & VIDEO PROCESSING	Ty	3	0/0	0/0	3

UNIT I DIGITAL IMAGE FUNDAMENTALS 9 Hrs

Simpleimagemodel,digitalimageformation, sampling, quantization, resolutions and representation, relationship among pixels,typesofdigitalimages.ColorImageProcessing: Color Representation, Chromaticity Diagram and ColorSpaces,typesofdigitalimagingandapplicationare as Enhancement-PointProcessing:ContrastStretching,Power-lawandGammaTransformation.
Histogram Processing: Histogram Equalization andMatching.

UNIT II FILTERING AND RESTORATION 9 Hrs

Degradation function and Noise Models,Spatial Domain Filtering: Correlationand Convolution, SmoothingLinearandNonlinearFilters:MeanandMedianFilters,AdaptiveFiltering,SharpeningLinearandNonlinearFilters:Derivative,Laplacian,UnsharpMasking,High-boostFiltering.FrequencyDomainFiltering:Filtering:Low-pass(Smoothing)&High-Pass(Sharpening Ideal,ButterworthandGaussianFiltering,UnsharpMaskingandHigh-BoostFiltering,HomomorphicFiltering,PeriodicNoiseReductionandInverseFiltering&WienerFiltering.

UNIT III EDGES, LINES AND BOUNDARY DETECTION 9 Hrs

First and Second Order EdgeOperators,Multi-scaleEdgeDetection,CannyEdgeDetectionAlgorithm,HoughTransform:LineandEdgeDetection,MorphologicalOperationsandApplication:Boundary,Skelton,Convex-Hull,Thinning,Pruningetc.

UNIT IV SEGMENTATION & FEATURE EXTRACTION 9 Hrs

Model-basedandprobabilisticmethodsandImageClassificationOptimalandMultilevelThresholding,GrayImageSegmentation,WatershedAlgorithm.

UNIT V COMPRESSION 9 Hrs

LossyandLosslesscompressiontechniques,JPEG2000andVariants,Introductiontovideoprocessing,Compressionstandardsandformats(MPEG&H.XXX),VideoStreaming.

TEXTBOOKS:

1.DigitalImageProcessing(3rdEdition)byWillamK.Pratt,JohnWilley&Sons
2. Gonzaleze and Woods ,"Digital Image Processing ", 3rd edition , Pearson
3. Yao wang, Joem Ostarmann and Ya – quin Zhang, "Video processing and communication ",1st edition , PHI

REFERENCE BOOKS:

1. M. Tekalp ,"Digital video Processing", Prentice Hall International

Open Electives Offered to Other Departments Except Department of IT

COURSE CODE:	COURSE NAME: CYBER SECURITY& FORENSICS	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCS22OE1	Prerequisite: **Nil**	Ty	3	0/0	0/0	3

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

OBJECTIVE:

Thestudents should be made to

- To learn the Basics of cyber crime.
- To Understand the infrastructure, information security.
- To learn on how to manage the risk.
- To Understand the overview of computer security.
- To ability to work with digital evidence, information collection and information protection.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the fundamental of Cybercrime[L2]
CO2	Understand the infrastructure and information security[L2]
CO3	Analyze and manage the risk[L4]
CO4	Understand about the computer security and how to access on it[L2]
CO5	Apply digital evidence, information collection and information protection concepts[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	1	1	1		1	2	1	1
CO2	3	3	1	3	2	1	1		1	2	1	1
CO3	3	3	1	3	2	1	1		2	2	1	2
CO4	3	2	1	2	3	1	1		3	2	1	2
CO5	3	3	1	3	2	1	1		1	2	1	1

COs /PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	1
CO2	3	1	1	1	1	1
CO3	3	2	1	1	1	1
CO4	3	3	1	2	2	2
CO5	3	3	1	1	1	1

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
EBCS22OE1	**CYBER SECURITY& FORENSICS**	Ty	3	0/0	0/0	3

UNIT I: Cyber Crime and Computer Crime **9 Hrs**

Cybercrime - Computer Intrusions and Attacks (Unauthorized Access) Computer Viruses, Time Bombs, Trojans, Malicious Code (Malware), Online Fraud and Identity Theft; introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimesand modules.

UNIT II: Information security **9 Hrs**

Information Security- The SDLC, The Security SDLC; Risk Management

UNIT III: SECURITY INVESTIGATION **9 Hrs**

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

UNIT IV: Information Welfare **9 Hrs**

Information Warfare, Cyber terrorism, and Hacktivism, Terrorism, Radicalization, and The War of Ideas, Trade Secret Theft and Economic Espionage, National Security.

UNIT V: Data Prevention **9 Hrs**

Desktop Security, Data and file Security, Network resources Security, Firewall, Mobile data Security.

Total Hours: 45

Text Books

1. David J. Loundy, COMPUTER CRIME, INFORMATION WARFARE, AND ECONOMIC ESPIONAGE, Carolina Academic Press (2003) (ISBN:0890891109).
2. Jack Balkin, et al. eds., CYBERCRIME: Digital Cops in a Networked World (NYU Press 2007) (ISBN:0814799833).
3. Michael E Whitman and Herbert J Mattord, ―Principles of Information Security, Vikas Publishing House, New Delhi, 2003

Reference books

1. Hacking for Dummies by by Kevin Beaver Published by Wiley Publishing, Inc.2004
2. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group–2008.
3. AnkitFadia" Ethical Hacking" second edition Macmillan India Ltd, 2006

COURSE CODE: EBCS22OE2	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
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:
Thestudents should be made to

- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- To know the various applications of AI

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand concept of Artificial Intelligence[L2]
CO2	Understand and analyze the problem and find a solution using Artificial Intelligence[L2]
CO3	Understand basic knowledge concepts of machine learning[L2]
CO4	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning[L3]
CO5	Create software agents to solve a problem[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	2	2	1	1	1	1		1	2	1	1
CO2	3	3	1	3	2	1	1		1	2	1	1
CO3	3	2	2	1	1	1	1		1	2	1	1
CO4	2	1	3	2	1	1	1		1	2	1	1
CO5	1	2	3	2	1	2	2		2	2	2	1

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

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
EBCS22OE2	**ARTIFICIAL INTELLIGENCE**	Ty	3	0/0	0/0	3

UNIT I PROBLEM SOLVING **9 Hrs**

Introduction – Agents – Problem formulation – uninformed search strategies – heuristics – informed search strategies –hill climbing– constraint satisfaction-pruning

UNIT IIPROBLEM SOLVING METHODS **9 Hrs**

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games

UNIT III KNOWLEDGE INFERENCE **9 Hrs**

Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

UNIT IV PLANNING AND MACHINE LEARNING **9 Hrs**

Basic plan generation systems - Strips -Advanced plan generation systems – K strips -Strategic explanations -Why, Why not and how explanations. Learning- Machine learning, adaptive Learning.

UNIT VAPPLICATIONS **9 Hrs**

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving

Total Hours: 45

TEXT BOOK:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill- 2008.
3. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007.
4. I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011

REFERENCES:

1. David Poole, Alan Mackworth, Randy Goebel, ”Computational Intelligence : a logical approach”, Oxford University Press, 2004.
2. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education, 2002. 3. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers, 1998.
3. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.
4. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.

COURSE CODE: EBCS22OE3	COURSE NAME : DATA BASE CONCEPTS	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
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

The students should be made to

- To learn the Basics of DBMS concepts.
- To Understand the DDL, DML and SQL Procedures.
- To learn the working of the Database software.

COURSE OUTCOMES (COs) :Students will be able to

CO1	Understand the basics of various file system[L2]
CO2	Analyze the various data models in DBMS[L24
CO3	Understand the concept of relational database[L2]
CO4	Understand the concept of Query language[L2]
CO5	Apply the various control structures and procedures[L3]

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	1	2	2		2	1	3	3
CO2	2	3	2	3	3	1	1		2	3	2	1
CO3	3	2	3	3	2	3	1		1	2	1	1
CO4	3	2	3	3	3	2	2		2	1	3	3
CO5	2	2	2	3	3	1	2		2	2	2	1

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

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
EBCS22OE3	**DATA BASE CONCEPTS**	Ty	3	0/0	0/0	3

Unit I: Fundamentals of Database **9 Hrs**

DBMS Definition, Characteristics of DBMS ,Application and advantages of DBMS, Instances, Schemas and Database States, Three Levels of Architecture, Data Independence, DBMS languages, Data Dictionary, Database Users, Data Administrators.

Unit II: ER Model **9 Hrs**

Data Models, types and their comparison, Entity Relationship Model, Entity Sets, Attributes and its types, Constraints, Keys, E-R Diagram, Weak Entity Sets, Extended E-R Features.

Unit III: Relational Model **9 Hrs**

Structure of Relational Databases, Relational Algebra (selection, projection, union, intersection, Cartesian product, Different types of join like natural join, outer join), Functional Dependencies, Good & Bad Decomposition, Anomalies as a database: A consequences of bad design, Normalization and its types.

Unit IV: SQL **9 Hrs**

Introduction to SQL, DDL, DML, and DCL statements, Creating Tables, Adding Constraints, Altering Tables, Update, Insert, Delete & various Form of SELECT- Simple, Using Special Operators for Data Access. Aggregate functions, Nested Sub queries, Modification of the Database.

Unit V: PL / SQL **9 Hrs**

Introduction to PL/SQL (blocks of PL/SQL, Variables, constants), Control Structure, Introduction to Stored Procedures, Functions, Cursor and Triggers.

Total Hours: 45

Text Book:

1. H. F. Korth& AbrahamSilverschatz, Database Concepts, Tata McGraw Hill, New Delhi

References:

1. C. J. Date, Database Systems, Prentice Hall of India, New Delhi.
2. Ivan Bayross, SQL, PL/SQL, The programming language of Oracle.

COURSE CODE: EBCS22OE4	COURSE NAME : SOTFTWARE ENGINEERING	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
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

The students should be made to

- .To learn software and system challenges with a comprehensive set of skills
- To Understand the ethical principles in the application of computing-based solutions to societal and organizational problems.
- Ability to work with diverse team and organizational

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the system development lifecycle[L2]
CO2	Apply the knowledge gained to model object-oriented software systems[L3]
CO3	Analyze and construct CASE tools and application software[L4]
CO4	Analyze systems in terms of general quality attributes and possible trade-offs presented within the given problem[L4]
CO5	Effectively participate in team-based activities[L2]

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	1	2	2		2	1	3	3
CO2	2	3	2	3	3	1	1		2	3	2	1
CO3	3	2	3	3	2	3	1		1	2	1	1
CO4	3	2	3	3	3	2	2		2	1	3	3
CO5	2	2	2	3	3	1	2		2	2	2	1

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

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	Course Title	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBCS22OE4	**SOFTWARE ENGINEERING**	Ty	3	0/0	0/0	3

Unit ISoftware Life Cycle Models **9Hrs**

Software Process Introduction – S/W Engineering Paradigm – life cycle models: waterfall, incremental, spiral, win-win spiral, Agile, evolutionary, prototyping – Object-Oriented life cycle models-system engineering – computer-based system – life cycle process – development process.

Unit II Software Requirements **9Hrs**

Requirements: Functional & non-functional – user-system requirement engineering process – feasibility studies – elicitation – validation & management – software prototyping – S/W documentation – Analysis and modelling – Case Tools.

Unit III Design Concepts **9Hrs**

Design and Principles Modular design – design heuristic – Software architecture – data design – architectural design – transform & transaction mapping –Introduction to SCM process – Software Configuration Items.

Unit IVSoftware Testing **9Hrs**

Testing Taxonomy of Software testing – levels – black box testing – testing boundary conditions – structural testing — regression testing– Software testing strategies – unit testing – integration testing – validation testing – system testing and debugging – Traceability matrix.

Unit V Software Project Management **9Hrs**

Software cost estimation – Function point models – COCOMO model –Project Scheduling-Delphi method – Software challenges – Software Maintenance-Reliability – Reliability and availability models

Total Hours: 45

Text Books

1. R.S.Pressman, “Software Engineering – A practitioners approach”, Eighth Edition, McGraw Hill International editions, 2014. REFERENCE BOOKS
2. Ian Somerville, “Software Engineering”, Tenth Edition, Pearson Education, 2015.

Reference Books

1.Hans van Vliet, “Software Engineering: Principles and Practice”, Third Edition, John Wiley & Sons, 2008.
2.Stephen R. Schach, “Object-oriented and classical software Engineering”, Fourth Edition, McGraw Hill, 2002.

COURSE CODE: EBCS22OL1	COURSE NAME: Artificial Intelligence Lab	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
	Prerequisite: Nil	Lb	0	0/0	3/0	1

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

OBJECTIVES:
The students should be made to
- To study and familiarize with Prolog by implementing simple AI Solutions
- To familiarize with LISP by implementing simple AI Solutions

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the concepts of Prolog[L2]
CO2	write code for AI based problems[L2]
CO3	Apply the knowledge to give solution AI based problems[L3]
CO4	Ability to identify solution constructs in AI based problems[L3]
CO5	Analyze the solution constructs to solve AI problems[L4]

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	2		1	1	1	1
CO2	1	1	1	1	1	1	2		1	1	1	1
CO3	1	1	1	1	1	1	2		1	1	1	1
CO4	2	2	2	2	2	2	2		2	2	2	2
CO5	1	1	1	1	1	1	2		1	1	1	1

COs /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	1
CO2	1	2	2	2
CO3	1	1	2	1
CO4	2	2	1	2
CO5	1	1	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: EBCS22OL1	COURSE NAME: Artificial Intelligence Lab	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
	Prerequisite: Programming Skill	Lb	0	0/0	3/0	1

List of Experiments

1. Study of Prolog.

2. Write simple fact for the statements using PROLOG.

3. Write predicates for the one that converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.

4. Write a program to solve the Monkey Banana problem.

5. Write a programin turbo prolog for medical diagnosis and show the advantage and disadvantage of green and red cuts.

6. Write a program to implement factorial, Fibonacci of a given number.

7. Write a program to solve 4-Queen problem.

8. Write a program to solve traveling salesman problem.

9. Write a program to solve water jug problem using LISP

Total Hours:45

COURSE CODE:	COURSE NAME: PHP / MySQL PROGRAMMING LAB	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBCS22OL2	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

OBJECTIVES:

The students should be made to

- have formal foundation on the relational model of data
- present SQL and procedural interfaces to SQL comprehensively
- familiar in systematic database design approaches in logical design & physical design

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the requirement and develop the website. [L2]
CO2	Apply the knowledge todesign back-end connectivity for data storage [L3]
CO3	Apply the knowledge & understanding of database analysis and design[L3]
CO4	Apply the programming skill and techniques to write programs using SQL [L3]
CO5	Apply the set operations and aggregate function[L3]

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	1		1		1	1
CO2	1	1	1	3	2	1	1		1		1	1
CO3	1	1	2	1	1	1	1		1		2	2
CO4	2	2	1	3	2	1	2		2	1	2	1
CO5	1	1	2	1	1	1	1		1	1	1	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1
CO2	1	1	1	1
CO3	2	2	1	1
CO4	1	1	1	1
CO5	2	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 Title	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBCS22OL2	**PHP / MySQL PROGRAMMING LAB**	Lb	0	0/0	3/0	1

List of Experiments

1. Implement theSelect statements for queries.
2. Perform the Nested queries using SQL.
3. Implement the Update operations using SQL.
4. Perform the Built in functions in SQL.
5. Implement of Use of index, creating views and querying in views.
6. Create a PHP webpage and print “hello world”.
7. Write a PHP program to swap two numbers.
8. Develop a PHP program to find maximum of three numbers.
9. Create a PHP program to find odd or even number from given number.
10. Write a PHP Program to demonstrate the variable function: Gettype():
11. Develop a PHP Program to demonstrate the variable unction: Settype():
12. Write a PHP program to drop table using MySQL. Write a PHP program that demonstrate passing variable using URL.
13. Create a student Registration in PHP and Save and Display the student Records.

Total Hours:45

COURSE CODE:	COURSE NAME: DATABASE LAB	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBCS22OL3	Prerequisite: Nil	Lb	0	0/0	3/0	1

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

OBJECTIVE:

The students should be made to

- To get knowledge in SQL toStore, Modify and Retrieval of data from the appropriate database

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the programming and theoretical concept of SQL commands[L2]
CO2	Analyze the problem and apply the syntactical structure of query [L4]
CO3	Apply the knowledge to store data in the database, using SQL and PL / SQL[L3]
CO4	Apply the knowledge to retrieve the data stored in the database, Using SQL and PL / SQL[L3]
CO5	Create a database and query it using SQL and PL / SQL[L4]

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	1	3	2		2	1	1	2
CO2	3	3	3	2	1	2	1		1	1	2	2
CO3	2	2	3	2	2	3	1		1	1	2	3
CO4	2	2	3	2	2	3	1		1	1	2	3
CO5	3	3	2	2	1	3	2		2	1	3	3

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

1/2/3 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: EBCS22OL3	DATABASE LAB	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
	Prerequisite: Nil	Lb	0	0/0	3/0	1

List of Experiments

I. PROGRAM TO LEARN SQL COMMANDS

1. Execution of DDL Commands
2. Execution of DML Commands
3. Insert Command
4. Select, From and Where Clause
5. Set Operation [Union, Intersection, Except]
6. Nested Queries
7. Join Operation
8. Modification of the Database

II. PL / SQL programs

11. Control statements (for loop)
12. Control statements (while loop)
13. Control statements (for reverse loop)
14. Control statements (loop end loop)
15. Series generation
16. Implementation of sub-program
17. Control statement (if-else end if)

Total Hours:45