

FACULTY OF ENGINEERING AND TECHNOLOGY

OUTCOME BASED EDUCATION

CURRICULUM & SYLLABUS

BACHELOR OF TECHNOLOGY
COMPUTER SCIENCE AND ENGINEERING
(DATA SCIENCE)

REGULATION 2022

(For the Students admitted from 2023-24 onwards)

DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

Department of CSE(DS)

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

Mission:
M1: Enable students with the best of Technologies and Knowledge 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(DS)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: Apply their data science expertise to address societal challenges, contribute to economic development, and drive innovation in industry through research, entrepreneurship, and community engagement initiatives.

B. Tech-CSE(DS) 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 knowledge and professional skill of theoretical Computer science to provide ethical solutions for real world problems
PSO2: To comprehend highly complex engineering problems with the knowledge of basic science and engineering.
PSO3: To design economic, innovative hardware and software system for various domains.
PSO4: To Implement data security measures and techniques to protect sensitive information by ensuring the confidentiality, integrity, and availability of data assets.

B. Tech-CSE(DS) 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	3	2	1
PEO2	2	2	1	2
PEO3	2	3	3	3
PEO4	3	1	2	2
PEO5	1	2	3	2
PEO6	2	2	2	2

Strength of Correlation 3-High 2-Medium 1-Low

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
EBCH22001	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
EBFL23IXX	FOREIGN LANGUAGE-I	**IE**	**1**	**0/0**	**1/0**	**1**	**HS**
Credits Sub Total						20	

TOTAL CREDITS: 38

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

B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)								
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	EBDA22001	FUNDAMENTALS OF DATA SCIENCE	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	

B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)								
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 ANALYTICS	ETL	2	0/0	2/0	3	PC
5	EBDA22I01	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

B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)								
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	EBDS22E04	DATA EXPLORATION AND DATA VISUALIZATION	Ty	3	0/0	0/0	3	PC
4	EBCS22EXX	PROGRAM ELECTIVE I	Ty	3	0/0	0/0	3	PE
5	EBXX22OEX	OPEN ELECTIVE I	Ty	3	0/0	0/0	3	ID
6	EBOL22I01	ONLINECOURSE (NPTEL/SWAYAM /Any MOOC approved by AICTE/UGC)	E	1	0/0	1/0	1	ID
PRACTICALS*								
1	EBCS22L05	NETWORK PROGRAMMING LAB	Lb	0	0/0	3/0	1	PC
2	EBDA22L01	DATA VISUALIZATION 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	EBDA22I02	TECHNICAL SKILL II	IE	0	0/0	2/0	1	SC
5	EBFL23IXX	FOREIGN LANGUAGE II	IE	1	0/0	1/0	1	HS
						Credits Sub Total	24	

B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)								
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	EBAI22002	NATURAL LANGUAGE PROCESSING CONCEPTS AND PRINCIPLES	Ty	3	0/0	0/0	3	PC
3	EBAI22004	ESSENTIAL OF MACHINE LEARNING	Ty	3	0/0	0/0	3	PC
4	EBCS22EXX	**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	EBDA22L02	NATURAL LANGUAGE PROCESSING LAB	Lb	0	0/0	3/0	1	PC
3	**E**BCC22I07	SOFT SKILL II -QUALITATIVE AND QUANTITATIVE SKILLS	IE	0	0/0	2/0	1	SC
4	EBDA22I03	TECHNICAL SKILL III	IE	0	0/0	2/0	1	SC
5	EBDA22I04	MINI PROJECT/INTERNSHIP	IE	0	0/0	3/0	1	SC
						Credits Sub Total	20	

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B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)								
VII SEMESTER								
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**	**Category**
1	EBDS22001	PREDICTIVE MODELS AND ANALYTICS	Ty	3	0/0	0/0	3	PC
2	EBCS22EXX	PROGRAM ELECTIVE III	Ty	3	0/0	0/0	3	PE
3	EBDA22002	DATA WAREHOUSING AND DATA MINING.	Ty	3	0/0	0/0	3	PC
4	EBCS22014	CLOUD COMPUTING	Ty	3	1/0	0/0	4	PC
5	EBAI22003	DEEP LEARNING PRINCIPLES	Ty	3	1/0	0/0	4	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	EBDA22I05	PROJECT PHASE – 1	IE	0	0/0	3/3	2	P
Credits Sub Total							22	

B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)								
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	EBDA22EXX	PROGRAM ELECTIVE IV	Ty	3	0/0	0/0	3	PE
3	EBDA22EXX	PROGRAM ELECTIVE V	Ty	3	0/0	0/0	3	PE
PRACTICALS*								
1	EBDA22L03	PROJECT PHASE – II	Lb	0	0/0	12/12	8	P
Credits Sub Total							17	

TOTAL CREDITS:167

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

Credit Summary

Semester : 1 : 18

Semester : 2 : 20

Semester : 3 : 25

Semester : 4 : 21

Semester : 5 : 24

Semester : 6 : 20

Semester : 7 : 22

Semester : 8 : 17

Total Credits : 167

B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)							
PROGRAM ELECTIVE -I							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBCS22E01	IMAGE PROCESSING	Ty	3	0/0	0/0	3
2	EBCS22E02	GEOGRAPHICAL INFORMATION SYSTEMS	Ty	3	0/0	0/0	3
3	EBCS22E03	DATABASE TUNING	Ty	3	0/0	0/0	3
4	EBCS22E04	COMPONENT BASED TECHNOLOGY	Ty	3	0/0	0/0	3
5	EBCS22E05	E-COMMERCE	Ty	3	0/0	0/0	3
6	EBCS22E06	COMPUTER GRAPHICS AND MULTIMEDIA	Ty	3	0/0	0/0	3
7	EBCS22E07	WIRELESS AND MOBILE NETWORKING	Ty	3	0/0	0/0	3
8	EBCS22008	PRINCIPLES OF COMPILER DESIGN	Ty	3	0/0	0/0	3

B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)							
PROGRAMELECTIVE -II							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBCS22E08	5 G NETWORKS	Ty	3	0/0	0/0	3
2	EBCS22E09	INFORMATION STORAGE MANAGEMENT	Ty	3	0/0	0/0	3
3	EBCS22E10	RISK MANAGEMENT	Ty	3	0/0	0/0	3
4	EBCS22E11	CRYPTOGRAPHY AND NETWORK SECURITY	Ty	3	0/0	0/0	3
5	EBCS22E12	MOBILE ADHOC NETWORKS	Ty	3	0/0	0/0	3
6	EBCS22E13	NETWORK INFRASTRUCTURE MANAGEMENT	Ty	3	0/0	0/0	3
7	EBCS22E14	CYBER FORENSICS AND INTERNET SECURITY	Ty	3	0/0	0/0	3
8	EBCS22E15	DATABASE SECURITY	Ty	3	0/0	0/0	3
9	EBCS22E16	MANAGEMENT INFORMATION SYSTEMS	Ty	3	0/0	0/0	3

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B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)							
PROGRAM ELECTIVE –III							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBCS22E17	MOBILE APPLICATION DEVELOPMENT	Ty	3	0/0	0/0	3
2	EBCS22E18	DATA SCIENCE	Ty	3	0/0	0/0	3
3	EBCS22E19	EMBEDDED SYSTEMS ARCHITECTURES	Ty	3	0/0	0/0	3
4	EBCS22E20	AGILE SOFTWARE DEVELOPMENT	Ty	3	0/0	0/0	3
5	EBCS22E21	FOUNDATION OF ROBOTICS AUTOMATION	Ty	3	0/0	0/0	3
6	EBCS22E22	SOCIAL COMPUTING	Ty	3	0/0	0/0	3
7	EBCS22E23	ENTERPRISE ARCHITECTURE	Ty	3	0/0	0/0	3
8	EBCS22E24	NETWORK FORENSICS	Ty	3	0/0	0/0	3
9	EBCS22E25	DISTRIBUTED COMPUTING	Ty	3	0/0	0/0	3

B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)							
PROGRAM ELECTIVE –IV							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBDA22E01	BUSINESS ANALYTICS FOR DATA SCIENCE	Ty	3	0/0	0/0	3
2	EBDA22E02	DESCRIPTIVE ANAYLSIS	Ty	3	0/0	0/0	3
3	EBDA22E03	DECISION SUPPORT SYSTEMS	Ty	3	0/0	0/0	3
4	EBDA22E04	KNOWLEDGE ENGINEERING AND MANAGEMENT	Ty	3	0/0	0/0	3
5	EBDA22E05	SOCIAL MEDIA ANALYTICS	Ty	3	0/0	0/0	3
6	EBDA22E06	BAYESIAN DATA ANALYSIS	Ty	3	0/0	0/0	3
7	EBAI22E22	PROMPT ENGINEERING	Ty	3	0/0	0/0	3

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B.TECH – COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)							
PROGRAM ELECTIVE –V							
S.NO.	**COURSE CODE**	**COURSE NAME**	**Ty/Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
1	EBDA22E07	PERVASIVE COMPUTING	Ty	3	0/0	0/0	3
2	EBDA22E08	NATURE INSPIRED COMPUTING	Ty	3	0/0	0/0	3
3	EBDA22E09	FORMAL LANGUAGE AND FINITE AUTOMATA	Ty	3	0/0	0/0	3
4	EBDA22E10	EXPLORATORY DATA ANALYSIS	Ty	3	0/0	0/0	3
5	EBDS22E02	OPERATIONS RESEARCH	Ty	3	0/0	0/0	3
6	EBDS22E08	SOCIAL NETWORK ANALYTICS	Ty	3	0/0	0/0	3
7	EBDS22E13	STREAM PROCESSING AND ANALYTICS	Ty	3	0/0	0/0	3

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

OPEN ELECTIVES OFFERED FOR B.Tech CSE(Data Science) 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/S Lr	P/R	C
1	EBEE22OE1	Electrical Safety for Engineers	Ty	3	0/0	0/0	3
2	EBEE22OE2	Energy Conservation Techniques	Ty	3	0/0	0/0	3
3	EBEE22OE3	Electric Vehicle Technology	Ty	3	0/0	0/0	3
4	EBEE22OE4	Biomedical Instrumentation	Ty	3	0/0	0/0	3
5	EBEE22OE5	Industrial Instrumentation	Ty	3	0/0	0/0	3
6	EBEE22OE6	Solar Energy Conversion System	Ty	3	0/0	0/0	3
7	EBEE22OE7	Wind Energy Conversion System	Ty	3	0/0	0/0	3
8	EBEE22OE8	Energy Storage Technology	Ty	3	0/0	0/0	3
9	EBEE22OE9	Electrical Machines	Ty	3	0/0	0/0	3

MECHANICAL ENGINEERING

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

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

Dr APJ Abdul Kalam Center For Research

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

OPEN LAB OFFERED FOR CSE STUDENTS
ELECTRONICS AND COMMUNICATION ENGINEERING

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

ELECTRICAL AND ELECTRONICS ENGINEERING

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

MECHANICAL ENGINEERING

S.NO	COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
1	EBME22OL1	Internal Combustion Engines and Steam Lab	Lb	0	0/0	3/0	1
2	EBME22OL2	Computer Aided Design 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 and 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	EBFL23I01	FRENCH-I
2	EBFL23I02	GERMAN-I
3	EBFL23I03	JAPANESE-I
4	EBFL23I04	ARABIC-I
5	EBFL23I05	CHINESE-I
6	EBFL23I06	RUSSIAN-I
7	EBFL23I07	SPANISH-I

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

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

Table 1: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	4	4	5	2..70	105
	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	71	167	167	100	3210

Table 2:List of New courses/value added courses//life skills/Electives/interdisciplinary /courses focusing on employability/entrepreneurship/skill development.

S.No	New courses	Value added courses	Life skill/ ETL	Electives	Inter Disciplinary	Focus on employability/ Entrepreneurship/ skill development.
1	C Programming and MS Office Tools				Orientation To Entrepreneurship & Project Lab	
2	Engineering Graphics, Fundamentals Of Computer Engineering		Python Programming			FOREIGN LANGUAGE-I
3	Fundamentals of Data Science				UNIVERSAL HUMAN VALUES: UNDERSTANDING HARMONY	
4		Technical Skill I			MICROPROCESSOR AND MICROCONTROLLERS	SOFT SKILL I -Employability Skills
5	Data Exploration And Visualization & Lab, Intelligent Multi Agent & Expert System	Technical Skill II, ONLINECOURSE (NPTEL/SWAYAM /Any MOOC approved by AICTE/UGC)		Total number of Program Electives in 5th sem: 08 (as given in the curriculum)		FOREIGN LANGUAGE II
6	Natural Language Processing Concepts And Principles & Respective Lab, Essential Of Machine Learning	TECHNICAL SKILL III	Communicative English Lab	Total number of Program Electives in 6th sem: 09 (as given in the curriculum)	Digital Principles An System Design	SOFT SKILL II -QUALITATIVE AND QUANTITATIVE SKILLS, MINI PROJECT/INTERNSHIP
7	Predictive Modeling And Analysis, Deep Learning Principles			Total number of Program Electives in 7th sem: 09 (as given in the curriculum)	OPEN LAB	PROJECT PHASE – 1
8	Principles Of Management And Behavioral Science			Total number of Program Electives IV & Vin 8th sem: 07+07 (as given in the curriculum)		PROJECT PHASE – II

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: 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 Learning
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 **6Hrs**

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 **6Hrs**

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 **6Hrs**

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. Chandrasena Rajeswaran & 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: 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: 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 12Hrs

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 12Hrs

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 12Hrs

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 12Hrs

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, 1989R. Murugeshan, 5.Electricity and Magnetism, S. Chand & Co., New Delhi, 1995
Thygarajan K & Ajay Ghatak, Laser Theory and Applications, Macmillan, New Delhi, 1988

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: 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 **12Hrs**

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 **12Hrs**

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 **12Hrs**

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 **12Hrs**

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 -VPOLYMERS AND NANO COMPOSITES **12Hrs**

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	Ty/Lb/ ETL/IE	L	T/SLr	P/R	C
EBME22ET1	Prerequisite : Nil	ETL	2	0/0	2/0	3

C: Credits, L: Lecture, T: Tutorial, SLr: Supervised Learning, P: Problem / Practical
R: Research, Ty/Lb/ETL/IE: Theory /Lab/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	ETL	2	0/0	2/0	3

UNIT I THERMAL ENGINEERING 14Hrs

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 14Hrs

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 10Hrs

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 12Hrs

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 10Hrs

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: 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 **3Hrs**

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 **3Hrs** 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 **3Hrs**

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 **3Hrs**

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 **3Hrs**

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: 15

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 **30 Hrs**

1. Find the factorial of a given positive number using function.
2. Calculate X raised to y using function.
3. Find GCD and LCM of two given integer numbers using function.
4. Find the sum of N natural numbers using function.
5. Book information using Structure.
6. Student information using Structure.
7. Print the address of a variable and its value using Pointer
8. Find area and perimeter of a circle
9. Check whether the given number is palindrome or not
10. Check whether the given number is prime or not
11. Calculate 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

Total Hours: 45

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: 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 3Hrs

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 3Hrs

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

UNIT III DESIGN THINKING 3Hrs

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 3Hrs

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 3Hrs

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

IDEA GENERATION, EVALUATION & PROJECT PRESENTATION 15Hrs

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: 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: 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/ ETL/IE	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 T types 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
EBCH22001	Prerequisite: Engg. Chemistry	Ty	3	0/0	0/0	3

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

OBJECTIVES:

The students should be made to

1.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
EBCH22001	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 **9Hrs**

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.

UNIT4 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 II: 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

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

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

OBJECTIVES:

The students should be made to

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

COURSE OUTCOMES (Cos): Students will be able to

CO1	Utilize the concept of Engineering Graphics Techniques to draft letters, Numbers, Dimensioning in Indian Standards
CO2	Demonstrate the drafting practice visualization and projection skills useful for conveying ideas in engineering applications.
CO3	Identify basic sketching techniques of engineering equipment's
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) **5**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 **10Hrs**

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 **9Hrs**

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

UNIT IV ISOMETRIC PROJECTION **9Hrs**

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

UNIT V ORTHOGRAPHICS PROJECTIONS **8Hrs**

Orthographic projection of simple machine parts – missing views

BUILDING DRAWING **7Hrs**

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 EBCS22001	COURSE NAME: FUNDAMENTALS OF COMPUTER ENGINEERING	Ty/Lb/ ETL/IE	L	T/ S.Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

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

OBJECTIVES:
The 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 Hour: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: 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 **6Hrs**

Authentic audios and videos

Prescribed Book: English Pronunciation in use – Mark Hancock,

Unit II Speaking **6Hrs**

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 **6Hrs**

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 **6Hrs**

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 **6Hrs**

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

Total Hours:30

Text Book:

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

ReferenceBook

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: 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	Apply the 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 **3Hrs**

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 **3Hrs**

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 **3Hrs**

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 **3Hrs**

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 IN PYTHON **3Hrs**

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

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.

30 Hrs

List of Experiments:

1. Develop a Python program using function to compute the factorial of agiven number.
2. Develop a Python program to find the sum of 'N' natural number usingfunction.
3. Develop a Python program to display only the positive elements of thelist.
4. Develop a Python program to find the second largest digit from a numberusing function.
5. Develop a Python program to find the largest digit from a number usingfunction.
6. Develop a Python program to check the given string is palindrome or not.
7. Develop a Python program to count the number of vowels in the givenstring.
8. Develop a Python program to calculate the number of characters and thenumber of words present in a string without using built-in functions andstring methods.
9. Develop a Python program to remove the duplicate items from a list.
10. Develop a Python program to read in a list of 'N' integers and print itselements in reverse order without using reverse slicing, reverse method.

Total Hours: 45

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

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

OBJECTIVES:

The students should be made to

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

COURSE OUTCOMES (COs): Students will be able to

CO1	Know about Environment and Ecosystem & Biodiversity
CO2	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

	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 3Hrs

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 3Hrs

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 3Hrs

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 3Hrs

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 3Hrs

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: 15Hrs

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 **EBMA22006**	COURSE NAME **: DISCRETE MATHEMATICS**	**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 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

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 and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Master the implementation of linked data structures such as linked lists and binary trees
  Be familiar with advanced data structures such as trees and hash tables.
- Be familiar with several sub-quadratic sorting algorithms including quicksort, merge sort and heap sort
- 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 **12Hrs**

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 IV NON 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**

TEXTBOOK

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

REFERENCES

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

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

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

OBJECTIVE:

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 (6thed.) Tata McGraw Hill, New Delhi

REFERENCE BOOKS:

1.Ramez, E. Shamkant, B. Navathe (2008) Fundamentals of database systems (5th ed.), Pearson Education

2.Date, C. J, (2012) An Introduction to Database Systems (8th ed.), Pearson Education

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

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

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 A Synchronous 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: EBDA22001	COURSE NAME : FUNDAMENTALS OF DATA SCIENCE	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/IE : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE :

The students should be made to

- Learn concepts, techniques and tools needed to deal with various facets of data science, including data collection and integration
  Understand the basic types of data and basic statistics
- Identify the importance of data regression models and data visualization techniques

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand basic terms and techniques in data science. [L2]
CO2	Apply the pre-processing techniques for generating quality data input[L3]
CO3	Analyze the parameters of exploratory data analytics[L4]
CO4	Develop the regression models using data science and analytics process.[L4]
CO5	Analyze and Apply visualization tools and techniques[L2]

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

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 CODE:	Course Title	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBDA22001	FUNDAMENTALS OF DATA SCIENCE	Ty	3	0/0	0/0	3

Unit - I Introduction **9Hrs**

Evolution of Data Science, Introduction to Data Science – Types of Data, Data Science Vs Big Data, Concept of Big Data, Concept of Data Warehousing, Introduction to Data Mining, Role of Data Scientist, Data Science Life Cycle, Data Science Roles – Data Science Project Stages – Data Science Applications in Various Fields – Data Security Issues, thinking in a structured way to solve data science problem statements.

Unit– II Pre-processing & collection of data **9Hrs**

Need of Data Pre-processing, Pre-processing of data and data collection, Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization, Data Storage, and management, Data preparation for analytics

Unit– III Exploratory Data Analytics **9Hrs**

Introduction to Data Analytics/Concept of Data Analytics Types of Data Analytics, Descriptive Statistics, Mean, Standard Deviation, Skewness, and Kurtosis, Box Plots, Pivot Table, Heat Map , Correlation Statistics , ANOVA , Exploratory Data Analytics, Confidence (statistical) intervals; variances and correlations

Unit– IV Regression& Model Development **9Hrs**

Simple and Linear Regression – Visual Model Evaluation – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Insample Evaluation Measures – Prediction and Decision Making

Unit– V Model Evaluation Generalization and Data Visualization **9Hrs**

Metrics for Out-of-Sample Evaluation Error – Cross Validation – Overfitting – Under fitting and Model Selection – Ridge Regression Prediction – Grid Search Testing Multiple Parameters, Data handling /Data wrangling using Python Definition, Types of visualization, data visualization, Data types, Data encoding , mapping variables , Conventional data visualization tools, Techniques for visual data representations, Types of data visualization

Total Hours: 45

Text Books

1. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2013.

Reference Books

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
2. G. Strang . Introduction to Linear Algebra, Wellesley-Cambridge Press, Fifth edition, USA, 2016.
3. Bendat, J. S. and A. G. Piersol. Random Data: Analysis and Measurement Procedures. 4th Edition. John Wiley & Sons, Inc., NY, USA, 2010.

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: Supervised Learning
P:ProjectR:ResearchC:CreditsT/L/ETL/IE:Theory/Lab/Embedded Theory and Lab/Internal Evaluation

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 able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

3/2/1indicatesstrengthofcorrelation3 –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 /Proiect
			√				√		

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

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

Purpose and motivation for the course, recapitulation from Universal Human Values-I - Self-Exploration– what is it? -Its content and process; 'Natural Acceptance'andExperientialValidation-astheprocessforself-exploration. – Continuous Happiness and Prosperity-A look at basic Human Aspirations - Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority- Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario– Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

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

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 Physical needs, meaning of Prosperity in detail - Programs to ensure Sanyam 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. Discuss program for ensuring health vs dealing with disease

UNIT III Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship 9Hrs

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship - Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the other salient 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- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationship. Discuss with scenarios. Elicit examples from students' lives.

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

Understanding the harmony in the Nature - Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in 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" can be used), pollution, depletion of resources and role of technology etc.

UNIT V Implications of the above Holistic Understanding of Harmony on Professional Ethics 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 for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for 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 of individual: as socially and ecologically responsible engineers, technologists and managers, (b)At the level of society: as mutually enriching institutions and organizations - Sum up .Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g.To discuss the conduct as an engineer or scientist etc.

Total Hours:45

Text Book:

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

Reference Books

Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

The Story of Stuff (Book).

The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.

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 and Lab/Internal Evaluation

OBJECTIVES : The students should be made to

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

COURSE OUTCOMES (COs) : Students will be able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

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

LIST OF EXPERIMENTS:

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

Software requirement: C/C++

Total Hours:45

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

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

OBJECTIVE:

Thestudents should be made to

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

COURSE OUTCOMES (COs) : Students will be able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

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

I. Program to learn DDL and DML commands

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

II. PL / SQL programs

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

Total Hours:45

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

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

OBJECTIVES:

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
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: C++	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. To impart the core language features of Java and its Application Programming Interfaces(API).
2. To demonstrate the use of threads, exceptions, files and collection frameworks in Java.
3. To familiarize students with GUI based application development and database connectivity.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Comprehend Java Virtual Machine architecture and Java Programming Fundamentals.
CO2	Design applications involving Object Oriented Programming concepts such as inheritance, association, aggregation, composition, polymorphism, abstract classes and interfaces.
CO3	Design and build multi-threaded Java Applications.
CO4	Build software using concepts such as files, collection frameworks and containers.
CO5	Design and implement Java Applications for real world problems involving Database 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 12Hrs

Java Basics: Java Design goal-Features of Java Language-JVM-Bytecode-Java source file Structure basic programming constructs Arrays one dimensional and multi-dimensional enhanced for loop String package

UNIT II OBJECT ORIENTED PROGRAMMING 12 Hrs

Class Fundamentals- Object Object reference array of objects constructors methods over-loading this reference static block - nested class inner class garbage collection finalize()Wrapper classes Inheritance types –use of super -Polymorphism abstract class interfaces packages and sub packages.

UNIT III ROBUSTNESS AND CONCURRENCY 12Hrs

Exception Handling-Exceptions Errors-Types of Exception–Control Flow in Exceptions -Use of try, catch, finally, throw, throws in Exception Handling - user defined exceptions –Multithreading Thread creation sharing the workload among threads synchronization interthread communication deadlock

UNIT IV FILES, STREAMS AND OBJECT SERIALIZATON 12Hrs

Data structures: Java I/O streams Working with files Serialization and deserialization of objects Lambda expressions, Collection frame work List ,Map, Set Generics Annotations

UNIT V GUI PROGRAMMING AND DATABASE CONNECTIVITY 12 Hrs

GUI programing using JavaFX, exploring events, controls and Java FX menus Accessing Databases using JDBC connectivity

Total Hours: 60

TEXT BOOKS

1. Herbert Schildt, The Complete Reference-Java, Tata McGraw-Hill Education, 10th edition, 217.
2. PaulJ.Deitel,HarveyDeitel, JavaSE8 for Programmers (Deitel DeveloperS eries)3rd Edition, 2014.
3.Y.Daniel Liang, Introduction to Java programming-comprehensive version-Tenth Edition, 2015.

REFERENCE BOOKS

1.Paul Deitel Harvey Deitel, Java HowtoProgram,PrenticeHall;9thedition,2011.
2.CayHorstmann BIG JAVA, 4thedition,JohnWileySons,2009
3.NicholasS.Williams, Professional Java for WebApplications,WroxPress,2014.

LAB EXERCISES

1. Write a Java program to display default value of all primitive data types of Java.
2. Write a Program To find the sum of command line arguments
3. Write an application that reads two integers, determines whether the first is a multiple of the second and print the result.
4. Write statements that perform the one-dimensional-array operations.
5. Write a program in java to create a class called employee with their employee id, salary and address as the data member , create an object to display the above employee details on screen.
6. Write a program in java to create a file to upload the student name, department and college name
7. Write a program in Java to create two threads to perform Odd and Even Number from 0 to 20.
8. Write a java program to create an abstract class
9. Write a java program to list all the files in a directory including files.

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

UNIT III CORRELATION &REGRESSION 12 hrs
Bi-variate data – Applications of Correlation: Karl Pearson's Coefficient of Correlation – Rank Correlation: Spearman's Rank Correlation – Linear Regression.

UNIT IV STANDARD DISTRIBUTIONS 12 hrs

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

UNIT V TESTING OF HYPOTHESIS 12 hrs

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

Total Hours: 60

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/IE : Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

Thestudents should be made to:

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

COURSE OUTCOMES (COs): Students will be able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

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

UNIT I BASIC CONCEPTS AND INTRODUCTION TO ALGORITHMS 9 Hrs

Introduction-Historical Background-Time Complexity-Space Complexity— Fundamentals of Algorithmic Problem Solving — Important Problem Types ——Asymptotic Notations and their properties. Analysis Framework — Empirical analysis — Mathematical analysis for Recursive and Non-recursive algorithms — Visualization

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER 9 Hrs

Brute Force – Closest-Pair and Convex Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem. Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication-Closest-Pair and Convex Hull Problems.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9 Hrs

Computing a Binomial Coefficient – Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees.

UNIT IV ITERATIVE IMPROVEMENT 9 Hrs

The Simplex Method-The Maximum-Flow Problem – Maximum 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 CONCEPTS & PROCESSES **9HRS**

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 PROCESS MANAGEMENT, SYNCHRONIZATION AND DEADLOCKS **9HRS**

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 MEMORY MANAGEMENT **9HRS**

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

UNIT IV STORAGE MANAGEMENT **9HRS**

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 CASE STUDY **9HRS**

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

Total Hours: 45

TEXT BOOKS:

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

REFERENCE BOOKS:

1.D.M.Dhamdhere. D. M. (2012) Operating Systems, (3 rd ed.), Tata McGraw Hill
2.Tanenbaum (2015) Modern Operating Systems,Pearson Publication.
William Stallings (2015) Operating Systems (8 th ed.) Prentice Hall of India

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

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

OBJECTIVES:

The students should be made to

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

COURSE OUTCOMES (Cos): Students will be able to

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

Mapping of Course Outcomes with Program Outcomes (Pos)

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

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

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

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

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

UNIT I **6Hrs**

The History of the Making of Indian Constitution, Preamble and the Basic Structures

UNIT II **6Hrs**

Fundamental Rights and Duties, Directive Principles of State Policy

UNIT III **6Hrs**

Legislature, Executive and Judiciary

UNIT IV **6Hrs**

Emergency Powers

UNIT V **6Hrs**

Special Provisions for Jammu and Kashmir, Nagaland and Other Regions, Amendments

Total Hours: 30

TEXT BOOKS:

1.D D Basu, Introduction to the Constitution of India,20th Edn.,LexisnexisButterworths, 2012.

REFERENCE BOOKS:

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

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

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

OBJECTIVES: The students should be made to

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

COURSE OUTCOMES (COs) : Students will be able to

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

Mapping of Course Outcomes with Program Outcomes (Pos)

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

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

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

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

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

UNIT I **6Hrs**

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

Knowledge System

UNIT II **6Hrs**

Traditional Medicine, Traditional Production and Construction Technology

UNIT III **6Hrs**

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

UNIT IV **6Hrs**

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

UNIT V **6Hrs**

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 /IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE :

The students should be made to

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

COURSE OUTCOMES (Cos): Students will be able to

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

Mapping of Course Outcomes with Program Outcomes (Pos)

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

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

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

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

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/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

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

Total Hours:45

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

UNIT I INTRODUCTION TO BIG DATA **12Hrs**

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 STREAMS **12Hrs**

: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- Real Time Sentiment Analysis-Stock Market Predictions.

UNITIII HADOOP **12Hrs**

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-How Map 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 ANALYTICS **12 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.

LAB EXERCISES

1. Exploration & Installation of HADOOP
2. Implementation of file Management Task
3. Basic Word Count Map Reduce Program.
4. Install Configure and run pythob, Numpy & Panday
5. Visualize Data using Basic plotting techniques in python.

COURSE CODE: EBDA22I01	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
EBDA22I01	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 Design a 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:	COURSE NAME: COMPUTER NETWORKS	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
EBCS22007	Prerequisite: OPERATING SYSTEMS	Ty	3	0/0	0/0	3

L:LectureT:Tutorial S.Lr:Supervised Learning P:Project R:ResearchC:Credits

T/L/ETL/IE: Theory /Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

The students should be made to

- Remember how the networks functions takes place
- Understand how communication takes place in various mediums
- Learn about the protocols for data communication in the network layers
- Study about the various network algorithms for smooth data communication

COURSEOUTCOMES(COs: Students will be able to

CO1	Students will understand and remember how network works. [L2]
CO2	Students will have knowledge on Ip address and analyze the protocols. [L1]
CO3	Apply knowledge about protocols to avoid congestion. [L3]
CO4	Acquaintance to apply algorithms in networks. [L4]
CO5	Will understand how layers of networks work. [L2]

Mapping of Course Outcomes with Program Outcomes (Pos)

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

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

3/2/1IndicatesStrengthOfCorrelation,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	COMPUTER NETWORKS	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

Domain name system-Electronic mail–Introduction to World Wide Web: HTTP, APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet, RTP.

TotalHours:45

TEXTBOOKS:

1.PetersonDavie(2012)Computer Networks-Asystem Approach (2nd ed.),Morgan Kauffman Harcourt Publishers.

2.JamesF.Kurose,KeithW.RossComputerNetworking:Atop-DownApproach/Edition6, Pearson publication,2012.

REFERENCEBOOKS:

1.AndrewS. Tanenbaum. DavidJ. Wetherall,"ComputerNetworks"5thEditionPHI,2011

2.WilliamStallings," Data and computer communications", PHI,2001

3. DouglasE.comer,"Inter networking with TCP/IP-Volume-I",PHI,5thedition2006

4.Godbole, "Data communicationandnetworking",TMH,2004.

5.ForouzanB.A., "Data Communications and networking", TMH, 2003.

COURSE CODE EBDS22E04	COURSE NAME : DATA EXPLORATION AND DATA VISUALIZATION	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/IE : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE : The students should be made to

- To outline an overview of exploratory data analysis.
- To perform univariate & bivariate data exploration and analysis
- Supports to summarize use of predictive analytics, data science and data visualization
- Build an effective Data Visualization system

COURSE OUTCOMES (COs) : Students will be able to

CO1	Handle missing data in the real world data sets by choosing appropriate methods.[L2]
CO2	Understand the key techniques and theory behind data visualization [L2]
CO3	Use effectively the various visualization structures (like tables, spatial data, tree and network etc.)[L3]
CO4	Evaluate information visualization systems and other forms of visual presentation for their effectiveness[L5]
CO5	Design and build data visualization systems[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	2	2	1	-	-	2	--	-	2	-	1
CO2	2	2	2	3	2	-	2	-	2	3	2	2
CO3	3	2	2	1	-	-	2	-	-	2	-	1
CO4	2	2	2	3	2	-	2	-	2	3	2	2
CO5	2	3	3	3	2	-	2	-	2	3	2	2

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

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

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

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBDS22E04	DATA EXPLORATION AND DATA VISUALIZATION	Ty	3	0/0	0/0	3

Unit I Introduction to Exploratory Data Analysis **9Hrs**

Introduction to Exploratory Data Analysis (EDA) –Steps in EDA, Data Types: Numerical Data – Discrete data, continuous data – Categorical data – Measurement Scales: Nominal, Ordinal, Interval, Ratio – Comparing EDA with classical and Bayesian Analysis – Software tools for EDA

Unit II Data Transformation Correlation Analysis and Time Series Analysis **9Hrs**

Transformation Techniques: Performing data deduplication - replacing values – Discretization and binning. Introduction to Missing data, handling missing data: Traditional methods - Maximum Likelihood Estimation.Types of analysis: Univariate analysis - bivariate analysis - multivariate analysis. Time Series Analysis (TSA): Fundamentals of TSA - characteristics of TSA – Time based indexing - visualizing time series – grouping time series data - resampling time series data

Unit III Value of Visualization **9Hrs**

What is Visualization and Why do it: External representation – Interactivity – Difficulty in Validation. Data Abstraction: Dataset types – Attribute types – Semantics. Task Abstraction – Analyze, Produce, Search, Query. Four levels of validation – Validation approaches – Validation examples. Marks and Channels

Unit IV Visualization Analysis and Design: Rules of thumb **9Hrs**

Categorical regions – Spatial axis orientation – Spatial layout density. Arrange spatial data: Geometry – Scalar fields – Vector fields – Tensor fields. Arrange networks and trees: Connections, Matrix views – Containment. Map color: Color theory, Color maps and other channels.

Unit V Manipulate view **9Hrs**

Change view over time – Select elements – Changing viewpoint – Reducing attributes. Facet into multiple views: Juxtapose and Coordinate views – Partition into views – Static and Dynamic layers – Reduce items and attributes: Filter – Aggregate. Focus and context: Elide – Superimpose – Distort – Case studies.

Total Hours: 45

Text Books

1.Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python” 1st Edition, 2020, Packt Publishing.
2.Tamara Munzner, Visualization Analysis and Design, A K Peters Visualization Series, CRC Press, 2014.

Reference Books

3.Tamara Munzner, Visualization Analysis and Design, A K Peters Visualization Series, CRC Press, 2014.
4.Scott Murray, Interactive Data Visualization for the Web, O’Reilly, 2013.
5.Alberto Cairo, The Functional Art: An Introduction to Information Graphics and Visualization, New Riders, 2012

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: NETWORK PROGRAMMING LAB	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: Supervised Learning P:Project R:ResearchC:Credits
Ty/Lb/ETL/IE:Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Hands on Experience to design an application using TCP and UDP sockets.
- Hands on Experience to design an interface to transfer a file between woends using FTP
- Hands on Experience to develop a RMI application for specific operation
- To have acknowledge to work with Network Simulators

COURSEOUTCOMES (COs): Students will be able to

CO1	Ability to apply the knowledge in Socket Programming using TCP and UDP[L3]
CO2	Design a Client/ Server Application Program by remembering the standards of protocol[L6]
CO3	Ability to create a Server based application using RMI and RPC concepts[L6]
CO4	Understand how network stimulator works[L2]
CO5	Analyze the state of network[L4]

Mapping of Course Out comes with Program Outcomes (POs)

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

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

LIST OF 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:	COURSENAME: **DATA VISULAZATIONLAB**	**Ty/Lb/ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
EBDA22L01	Prerequisite: **Python Programming**	Lb	0	0/0	3/0	1

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

OBJECTIVES:

The students should be made to

- To comprehend fundamental data visualization ideas like correlation, linear relationships, and log scales and to interpret data plots.
- To use line and scatter plots to investigate the relationship between two continuous variables.

COURSEOUTCOMES(COs): Students will be able to

CO1	Understanding of Types of Data Visualization using Python concept.
CO2	Apply Design Effective Data Visualization using Python Libraries.
CO3	Analyze the concept of Matplotlib& Pandas.
CO4	Apply demonstrative skills on creating visual representation of Data using Python
CO5	Analyze demonstrate skills in Sea born & Plots.

MappingofCourseOutcomes withProgramOutcomes(POs)

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

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

3/2/1IndicatesStrength OfCorrelation,3–High,2-Medium,1-Low

Category	BasicScience	Engineering	Humanities andsocial	ProgramCore	Program elective	OpenElective	InterDisciplinary	SkillCompon	Practical /Project			
				✔					✔			

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/ S.Lr	P/R	C
EBDA22L01	DATA VISULAZATIONLAB	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

1. Write simple python programs to visualize using Box plot , Scatter plot, Histogram, Pie chart and Barchart
2. Plotting a line chart of date versus temperature by adding Label on X and Y axis, and adding a Title and Grids to the chart using Matplotlib.
3. Create a 12×12 Heatmap with Random data using Matplotlib
4. Implement a python program for a simple scatter plot using Matplotlib, which is generally used to observe the relations between two attributes in the dataset
5. Write a python program using pandas, which is used to observe the relations between two different features of a dataset (horizontal bar chart)
6. Implement a python program using Grammar of Graphics library used to describe and create a wide range of statistical graphics and compose plots by mapping data to the objects that constitute a plot[Histogram with plotnine]
7. Execute a python program using Seaborn to visualize the skew of distribution and to identify potential outliers [Boxplot]
8. Write a python program using Seaborn to visualize the statistical relationship between the data points [Relational plot]
9. Write a python program to visualize the analysis of shopping patterns [Heatmaps]
10. Implement a python program using Altair library to create unique binned scatterplot visualization of a dataset

Software requirement: Python Programming

Total Hours:45

Course Code **EBAI22ET3**	Course Name **:** **INTELLIGENT MULTI AGENT AND EXPERT SYSTEMS**	**Ty/ Lb/ ETL/IE**	**L**	**T/ S.Lr**	**P/R**	**C**
	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 **12Hrs**

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 **12Hrs**

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: Touring Machines, InteRRap, HOMER architecture.

UNIT III AGENTCOMMUNICATIONANDINTERACTIONPROTOCOLS **12 Hrs**

Agent Communications: Knowledge Query and manipulation Language (KQML), Knowledge Interchange Format (KIF), Ontology, Classifying multi-agent interactions: Multi-agentEncounters-Competitiveandzero-sumandotherinteractions-Cooperation.

UNIT IV INTRODUCTIONTOEXPERTSYSTEM **12Hrs**

Expert Systems: 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 **12Hrs**

Basic forms of inference: abduction; deduction; Induction Rule- based representations (with backward and forward Reasoning) Logic -based representations (with Resolution refutation), Implementation Tools: Prolog, CLIPS.

Total Hours: 60

List of Experiments :

1. Study of PROLOG
2. Write a program to solve 8 – queens problem
3. Solve any problem using Depth first Search
4. Solve any problem using Best First Search
5. Solve Robot Traversal problem using means End Analysis
6. Solve Travelling Salesman problem

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
3.ArtificialIntelligence‖,(2ndEd.).MITPress,2013.
Dan W. Patterson, ‐Introduction to AI & Expert System‖, PHI, 2007

REFERENCE BOOKS

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

COURSE CODE:	COURSE NAME: TECHNICAL SKILL II	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBDA22I02	Prerequisite: Nil	IE	0	0/0	2/0	1

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

OBJECTIVES:

The students should be made to

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

COURSE OUTCOMES (COs): Students will be able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBDA22I02	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

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 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	Analyze various testing and maintenance techniques[L4]
CO5	Apply Systematic Procedure for Software Design and Deployment and learn quality management standards[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**	**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**	**1**	**3**	**2**	**2**	**1**	**3**
CO5	**2**	**2**	**3**	**1**	**3**	**2**	**1**	**1**	**3**	**1**	**3**	**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 & QUALITY MANAGEMENT STANDARDS 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.

Scope of quality management standards - ISO 9001and ISO 9000-3 - Certification according to ISO 9000-3 - Capability Maturity Models - CMM and CMMI Assessment Methodology -Bootstrap Methodology - ISO/IEC 15504 Software Process Assessment Standard - IEEE Software Engineering Standards,Security coding standards,,SEI CERT coding standards.

TEXT BOOK:

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

REFERENCES:

1. Object oriented and classical software engineering by Stephen R. Schach, McGraw Hill
2. Ian Sommerville (2008) Software Engineering (9th ed.) Pearson Education Asia
3. Ali Bahrami (2008) Object Oriented System Development McGraw Hill international
4. Roger S. Pressman (2010) Software Engineering: A Practitioner Approach (8th ed.) McGraw hill Publications
5. Grady Booch (2009) Object oriented Analysis &design ,Pearson Education India
6. Publisher: IEEE Computer Society Presss,United States,ISBN:978-0-471-63457-7
7. Software Quality Assurance from theory to implementation - Daniel Galin
8. Secure Coding in C and C++ (Sei Series in Software Engineering): Secure Coding in C and C+_2 (Sei Series in Software Engineering (Old Edition)) Paperback – 2 April 2013 by Robert Seacord (Author)
9. ICT Security Trends,William Dimitrov,Sofia ,2017,Avangard,ISBN 978-619-160-766-2
10. Pattern & Security requirements engineering -based establishment of security standard by Kristian Beckers

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 AND 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 Deleted Interpolation – 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 – Probabilistic Context-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 Sense Disambiguation - 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 – Interpretation -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: 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	PO 9	PO10	PO11	PO12
CO1	3	3	3	1	3	2	1	1	-	-	1	1
CO2	3	3	3	3	3	1	1	-	-	-	1	1
CO3	3	3	3	3	3	2	1	1	-	-	1	1
CO4	3	3	3	3	3	2	1	-	-	-	1	2
CO5	3	3	3	3	3	1	1	-	-	-	1	1

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

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

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

COURSE CODE	COURSE NAME	Ty/ Lb/ ETL/IE	L	T/ S.Lr	P/R	C
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 **EBCS22L07**	COURSE NAME**:** **OBJECT ORIENTED SOFTWARE ENGINEERING LAB**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: OBJECT ORIENTED PROGRAMMING WITH C++	Lb	0	0/0	3/0	1

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

OBJECTIVES:

The students should be made to

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

COURSE OUTCOMES (COs): Students will be able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
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: EBDA22L02	COURSE NAME: NATURAL LANGUAGE PROCESSING LAB	Ty/ Lb/ ETL/ IE	L	T/ S.Lr	P/R	C
	Prerequisite: Artificial Intelligence	Ty	0	0/0	3/0	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 Fundamentals of Word Analysis.
- Master Techniques for Word Generation and Morphology.
- Gain Proficiency in N-Grams and Smoothing Techniques.
- Master POS Tagging using Hidden Markov Models and Viterbi Decoding.
- Develop Skills in Building POS Taggers and Chunkers.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Recognize the basic concepts of word analysis techniques such as tokenization and stemming. (L1)
CO2	Describe the process of word generation and its applications in language modeling and text generation. (L2)
CO3	Identify morphological components in words and analyze their meanings. (L3)
CO4	Analyze the distribution of N-Grams in a text corpus. (L4)
CO5	Evaluate the effectiveness of various smoothing methods in improving language model accuracy. (L5)

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	2
CO2	2	2	2	2
CO3	2	2	3	2
CO4	1	2	2	1
CO5	1	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
EBDA22L02	NATURAL LANGUAGE PROCESSING LAB	IE	0	0/0	3/0	1

1.Word Generation:
- Implement a word generation algorithm in a language of your choice that creates new words based on phonetic rules.
- Develop a web-based application that generates random words by combining syllables from a given set.

2.Morphology:
- Create a program in a language of your choice that performs stemming on a list of words using the Porter stemming algorithm.
- Design a function to analyze the morphology of words by identifying and extracting affixes (prefixes and suffixes) in a given language.

3.N-Grams:
- Write a script in a language of your choice to compute the frequency of N-Grams (e.g., bi-grams or tri-grams) in a text dataset.
- Develop a command-line tool that predicts the next word in a sentence based on N-Grams probabilities.

4.N-Grams Smoothing:
- Implement Laplace smoothing for N-Grams in a language of your choice to handle unseen sequences in a language model.
- Develop a program to apply Good-Turing smoothing to N-Grams frequencies to improve the accuracy of language models.

5.POS Tagging: Hidden Markov Model:
- Create a POS tagging system in a language of your choice using a Hidden Markov Model (HMM) trained on labeled text data.
- Develop a console-based application that tags parts of speech in a sentence using Viterbi decoding based on an HMM.

6.POS Tagging: Viterbi Decoding:
- Write a function in a language of your choice to perform Viterbi decoding for POS tagging using an HMM.
- Develop a POS tagger using Viterbi decoding in a language of your choice and evaluate its accuracy on a test dataset.

7.Building POS Tagger:
- Design a rule-based POS tagger in a language of your choice that assigns tags to words based on predefined grammatical rules.
- Create a machine learning-based POS tagger using algorithms like logistic regression or decision trees in a language of your choice.

8.Chunking:
- Implement noun phrase chunking using regular expressions in a language of your choice.
- Develop a chunker in a language of your choice that identifies verb phrases in a given sentence using syntactic patterns.

9.Building Chunker:
- Create a sequence labeling system in a language of your choice that trains a chunker using a labeled dataset and CRF (Conditional Random Fields) algorithm.
- Design a neural network-based chunker using LSTM (Long Short-Term Memory) architecture for sequence labeling tasks in a language of your choice.

Total Hours:45

COURSE CODE: EBCC22I07	COURSE NAME: SOFT SKILL – II (QUALITATIVE AND QUANTITATIVE 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
T/L/ETL/IE : Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE :

The students should be made to

- To bring behavioural patterns of students.
- To train them for corporate culture.
- To create self-awareness.
- To build confidence.
- To train the students for facing the interviews and develop interpersonal relationship.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Recognize and apply arithmetic knowledge in a variety of contexts.
CO2	Ability to identify and critically evaluate philosophical arguments and defend them from criticism.
CO3	Define data and interpret information from graphs.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBCC22I07	SOFT SKILLS II (QUALITATIVE AND QUANTITATIVE SKILLS)	IE	0	0/0	2/0	1

(Common to all E&T courses)

UNIT I Logical Reasoning I

Logical Statements – Arguments – Assumptions – Courses of Action.

UNIT II Logical Reasoning II

Logical conclusions – Deriving conclusions from passages – Theme detection.

UNIT III Arithmetical Reasoning I

Number system – H.C.F & L.C.M – Problem on ages – Percentage – Profit & Loss – Ratio & Proportion – Partnership.

UNIT IV Arithmetical Reasoning II

Time & Work – Time & Distance – Clocks – Permutations & Combinations – Heights & Distances – Odd man out and Series.

UNIT V Data Interpretation

Tabulation – Bar graphs – Pie graphs – Line graphs.

Total Hours:30

Reference Book:

1. R.S.Agarwal, A modern approach to Logical Reasoning, S.Chand& Co., (2017).

2. R.S.Agarwal, A modern approach to Verbal and Non verbal Reasoning, S.Chand& Co., (2017).

3. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S.Chand& Co., (2017).

4. A.K.Gupta, Logical and Analytical Reasoning, Ramesh Publishing House, (2014).

5. B.S.Sijwali, Indusijwali, A new approach to Reasoning (Verbal and Non verbal), Arihant Publishers, (2014).

COURSE CODE: EBDA22I03	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	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
EBDA22I03	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: **EBDA22I04**	COURSE NAME : **MINI PROJECT /INTERNSHIP**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite : NIL	**IE**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE :

The students should be made to

- The main objective of the Inplant training is to provide a short-term work experience in an Industry/ Company/ Organization

COURSE OUTCOMES (COs) : Students will be able to

CO1	Aspire an insight of an industry / organization/company pertaining to the domain of study.
CO2	Construct skills and knowledge for a smooth transition into the career.
CO3	Support field experience and get linked with the professional network.
CO4	To equip the students with industry knowledge and understanding of various possible technologies.
CO5	To impart the knowledge of various technologies form the industry resources

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBDA22I04	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 EBDS22001	COURSE NAME: **PREDICTIVE MODELS AND ANALYTICS**	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: Statistical Concepts	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

- Learn the fundamental principles of analytics for business.
- Learn how to Visualize and explore data to better understand relationships among variables.
- Understand the techniques of modeling and examine how predictive analytics can be used in decision making.
- Apply predictive models to generate predictions for new data.
- Define and apply time series forecasting models in a variety of business contexts.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the importance of predictive analytics and processing of data for analysis
CO2	Understand the different types of predictive models.
CO3	Apply regression and classification model on applications for decision making and evaluate the performance
CO4	Analyze the impact of class imbalance on performance measure for model predictions and models that can mitigate the issue during training.
CO5	Apply time series forecasting models in a variety of business contexts.

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

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	Practical /Project
				✓					

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBDS22001	PREDICTIVE MODELS AND ANALYTICS	Ty	3	0/0	0/0	3

UNIT I TIME SERIES ANALYSIS 9Hrs

Introduction to predictive analytics – Business analytics: types, applications - Methods for time series analyses – Analysis: Motivation – Exploratory analysis – Prediction and forecasting – Classification – Regression analysis – Signal estimation – Segmentation. Models – Autoregressive model - Partial autocorrelation function.

UNIT II DATA PRE-PROCESSING AND MODEL TUNING 9Hrs

Data transformations: Individual predictors, Multiple predictors, Dealing with missing values, Removing. Adding, Binning Predictors, Computing, Model Tuning, Data Splitting, Resampling.

UNIT IIIPREDICTIVE MODELING 9Hrs

Models: predictive models – descriptive models – decision models - applications - analytical techniques- Propensity models, cluster models, collaborative filtering, applications and fundamental limitations. Statistical Modeling- Formal Definition, Model Comparison, Classification.

UNIT IV MODEL SELECTION 9 Hrs

Preparing to model the data: supervised versus unsupervised methods, statistical and data mining methodology, cross-validation, overfitting, bias-variance trade-off, balancing the training dataset, establishing baseline performance.

UNIT IV REGRESSION AND CLASSIFICATION MODELS 9Hrs

Measuring Performance in Regression Models - Linear Regression and Its Cousins - Non-Linear Regression Models - Regression Trees and Rule-Based Models Case Study: Compressive Strength of Concrete Mixture, Measuring Performance in Classification Models - Discriminant Analysis and Other Linear Classification Models - Non-Linear Classification Models - Classification Trees and Rule-Based Models – Model Evaluation Techniques.

Total Hours: 45

TEXT BOOK:

1.Kuhn, Max, and Kjell Johnson. Applied Predictive Modeling, 3rd Edition, Springer, 2019.

REFERENCES:

1. Jeffrey Strickland, Predictive analytics using R, Simulation educators, Colorado Springs, 2015.
2. Richard V.McCarthy, Mary.M.McCarthy, Wendy Ceccucci, Applying Predictive Analytics, 2nd Edition, Springer 2022.
3. Dinov, ID., Data Science and Predictive Analytics: Biomedical and Health Applications using R, Springer, 2018.
4. Anasse Bari, Mohamed Chaouchi, Tommy Jung, Predictive Analytics for dummies, 2nd edition Wiley, 2016.
5. Daniel T.Larose and Chantal D.Larose, Data Mining and Predictive Analytics, 2nd edition Wiley, 2015.

Subject Code: **EBDA22002**	Subject Name : **DATA WAREHOUSING AND DATA MINING**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: NIL	**Ty**	**3**	**00**	**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 :

- Provide an overview of the methodologies and approaches to data mining
- Gain insight into the challenges and limitations of data mining techniques and data warehousing
- Applying data mining solutions using common data mining tools

COURSE OUTCOMES (COs) : (3- 5)

CO1	Identify the functionality of the various data mining and data warehousing component
CO2	Appreciate the strengths and limitations of various data mining and data warehousing models
CO3	Explain the analyzing techniques of various data
CO4	Describe different methodologies used in data mining and data ware housing.
CO5	Compare different approaches of data ware housing and data mining with various 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**	**3**	**3**	**3**	**3**	**1**	**3**	**2**	**3**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**1**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**1**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**1**	**3**	**3**	**2**	**3**	**1**	**3**	**3**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**3**	**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**	**1**	**3**	**3**
CO5	**3**	**2**	**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
EBDA22002	DATA WAREHOUSING AND DATA MINING	Ty	3	0/0	0/0	3

UNIT I DATA WAREHOUSING **9 Hrs**

Introduction to Data Warehousing- Advantages- What makes Data Warehousing a reality- Data warehousing Components-Building a Data Warehouse-mapping Data Warehouse to a Multiprocessor-Architecture-DBMS Schemas for Design Support

UNIT II ETL AND BUSINESS TOOLS **9 Hrs**

Data Extraction-Cleaning and Transformation tools- Meta data. Reporting and Query tools and Application-OLAP Patterns and Models- Statistics

UNIT III DATA MINING **9 Hrs**

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.- Data Cleaning –Missing Values-Noisy Data-Inconsistent Data-Data Integration and Transformation-Data Reduction -Dimensionality Reduction – Evaluation criteria of Various Mining Techniques

UNIT IV ASSOCIATION RULE MINING AND CLASSIFICATION **9 Hrs**

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Constraint Based Association Mining – Classification and Prediction - Decision Tree Induction - Entropy and Classification Algorithms -Bayesian Classification – Rule Based Classification

UNIT V CLUSTERING TECHNIQUES **9Hrs**

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods - Kmeans – Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Genetic Algorithm For Mining - Data Mining Applications

Total Hours: 45

TEXT BOOKS:

1. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2021.
2. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2020.

REFERENCE BOOKS:

1. Arun K Pujari (2020) Data Mining Techniques 4th edition, Universities Press (India) Ltd.
2. Sam Anahory, Dennis Murry (2012) Data Warehousing in the real world, Pearson Education
3. Margaret H. Dunham (2014) Data Mining: Introductory and Advanced Topics, Pearson

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, Comet Cloud: An Autonomic Cloud Engine, T-Systems' Cloud-Based Solutions for Business Applications, Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments, The Map Reduce 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 Rajkumar Buyya. "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: EBAI22003	COURSE NAME: 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 Neural Networks.
- To design and develop an application using specific deep learning models.
- 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-world problems.
CO2	Understand different methodologies to create application using deep nets.
CO3	Identify and apply appropriate deep learning algorithms for analyzing the data for variety of problems.
CO4	Implement different deep learning algorithms
CO5	Design the test procedures to assess the efficacy of the developed model.

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: Res Net, Alex Net – Applications.

UNIT IV RECURRENT NETWORKS 12Hrs

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 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

- Apply supervised and unsupervised machine learning algorithms to real-world datasets for predictive and descriptive analytics.
- Utilize feature engineering techniques to extract meaningful insights from data and improve model performance.
- Evaluate and compare the performance of different machine learning models using appropriate metrics.
- Optimize machine learning models through hyperparameter tuning and ensemble learning methods.
- Deploy trained machine learning models in production environments and monitor their performance over time.

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	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 the FIND-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 Cloud Sim 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: **EBDA22I05**	COURSE NAME: **PROJECT PHASE - I**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: NIL	IE	0	0/0	3/3	2

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : 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
EBDA22I02	**PROJECT PHASE – I**	**IE**	0	0/0	3/3	2

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 Feasibility study as a survey paper

DESCRIPTION:

Students are expected to do the Project in a group of 3 to 4 students. They should identify the area/topic of the Project and should collect the literatures related to the project. Students intending to do Industrial projects will approach the industries with the support of the university, identify the industrial problem and finalize the project. In case of Industrial projects apart from Industry guide, a guide has to be appointed by the department. At the end of the Semester the students should submit their Project Phase - I report to the Department and Viva -Voce examination will be conducted by the examiners duly appointed by the Head of the department.

Total Hours:45

VIII SEMESTER

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

L:LectureT:Tutorial SLr: Supervised Learning P:Project R:ResearchC:Credits
T/L/ETL/IE:Theory/Lab./Embedded Theory and Lab./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	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project			
							✓					

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

UNIT I INTRODUCTION **9Hrs**

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 **9Hrs**

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 **9Hrs**

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 **9Hrs**

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 **9Hrs**

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: EBDA22L03	COURSE NAME : PROJECT PHASE – II	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: Project Phase-I	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
EBDA22L03	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

PROGRAM ELECTIVE-I

COURSE CODE: **EBCS22E01**	COURSE NAME: **IMAGE PROCESSING**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Nil	**Ty**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVES:

The students should be made to

- To Lean the image fundamentals and mathematical transforms necessary for image processing.
- To Learn the image enhancement and frequency domain of various transform
- To Learn image restoration procedures.
- To Learn the image segmentation and representation techniques
- To Learn the image compression procedures

COURSE OUTCOMES (COs) :Students will be able to

CO1	To understand properties of digital image and its fundamentals (L1)
CO2	Apply image enhancement and Analyze images in the frequency domain (L3)
CO3	Apply image restoration techniques (L3)
CO4	Apply segmentation method and detect boundary region of an image (L3)
CO5	Able to improve the quality of an image (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**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	
CO2	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**1**				**1**
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**		**1**			
CO4	**2**	**2**	**2**	**1**	**2**	**2**	**2**		**1**			
CO5	**3**	**3**	**2**	**2**	**2**	**1**	**2**		**1**		**1**	**1**

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

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

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

COURSE CODE	COURSENAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBCS22E01	IMAGE PROCESSING	Ty	3	0/0	0/0	3

UNIT I DIGITAL IMAGE FUNDAMENTALS 9 Hrs

Digital image representation-Fundamental steps in image processing -Elements of digital image processing systems, Digital Image Fundamentals - Elements of visual perception-A simple image model -Sampling and quantization - Some basic relationship between pixels-Imaging geometry -2D Transformations-DFT, DCT, KLT and SVD.

UNIT II IMAGE ENHANCEMENT 9 Hrs

Background -Enhancement by point Processing -Enhancement in the frequency domains - Spatial Domain: Gray level transformations: Histogram Processing, Spatial filtering, Image Smoothing, Image Sharpening. - Color image processing. Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9 Hrs

Image Restoration: -Algebraic approach to restoration- degradation model, Properties, Noise models –Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener - Interactive Restoration.

UNIT IV IMAGE SEGMENTATION 9 Hrs

Images Segmentation: Detection of discontinuous, Edge linking and boundary detection - Thresholding - Region - Oriented segmentation – The use of motion in segmentation. Morphological image processing: Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms.

UNIT V IMAGE COMPRESSION & OBJECT RECOGNITION 9 Hrs

Fundamentals -image Compression models -Elements of information Theory - Error-free Compression - Lossy Compression - Image Compression standards. Object Recognition: Patterns and patterns classes, recognition based on decision–theoretic methods, matching, optimum statistical classifiers, neural networks, structural methods – matching shape numbers, string matching

Total Hours: 45

TEXT BOOKS:

Digital Image Processing, RafealC.Gonzalez, Richard E.Woods, Second Edition, Pearson Education/PHI.

REFERENCE BOOKS:

1. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Second Edition, Thomson Learning.
2.Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
3. Computer Vision and Image Processing, Adrian Low, Second Edition, B.S.Publications
4. Digital Image Processing using Matlab, RafealC.Gonzalez, Richard E.Woods, Steven L. Eddins, Pearson Education.

COURSE CODE: EBCS22E02	COURSE NAME: GEOGRAPHICAL INFORMATION 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
T/L/ETL /IE: Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

The students should be made to:

- The students will be able to design, explore, interpolate and analyze GIS models
- To create a new geo coding technique and apply the learnt GIS modeling for a real time case study.

COURSE OUTCOMES (COs) : Students will be able to	
CO1	Able to apprehend GIS concepts (L2)
CO2	Understand the various GIS models (L1)
CO3	Apply the learnt GIS models in real time application (L3)
CO4	To analyze the various GIS techniques (L4)
CO5	To apply the new geo coding technique for real time case study(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	1	2	3	3		2	2		
CO2	2	2	2	2	2	2	2		2	1		
CO3	3	2	3	3	2	3	2	2	1	2		1
CO4	3	1	2	3	3	2	2		2	1	1	1
CO5	3	3	3	2	2	2	1	2	2	1	1	1

COs /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	2
CO2	2	2	1	1
CO3	2	1	1	2
CO4	2	1	2	1
CO5	2	2	2	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
EBCS22E02	GEOGRAPHICAL INFORMATION SYTEMS	Ty	3	0/0	0/0	3

OBJECTIVES:

- The students will be able to design, explore, interpolate and analyze GIS models
- To create a new geo coding technique and apply the learnt GIS modeling for a real time case study.

UNIT I BASIC CONCEPTS **9 Hrs**

Introduction - History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – Coordinate Systems - Vector Data Model - Raster Data Model.

UNIT II DATA ACQUISTION & MANIPULATION **9 Hrs**

GIS Data Acquisition - Geometric Transformation - Spatial Data Editing - Attribute Data Input and Management - Data Display and Cartography.

UNIT III DATA ANALYSIS **9 Hrs**

Data Exploration - Vector Data Analysis tools- Raster Data Analysis tools - Terrain Mapping and Analysis - Viewsheds and Watersheds.

UNIT IV INTERPOLATION &MODELLING **9 Hrs**

Spatial Interpolation - Geocoding and Dynamic Segmentation - Path Analysis and Network Applications - GIS Model and Modelling

UNIT V APPLICATIONS **9 Hrs**

GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.

Total Hours: 45

TEXT BOOK:

1. Kang-tsung Chang (2015), Introduction to Geographic Information Systems, (8th ed.), Mcgrawhill ISBN 0078095131, 9780078095139

REFERENCE BOOKS:

1. Prithvish Nag And Smita Sengupta, Introduction To Geographical Information Systems, Concept Publishing Company, 2007, ISBN 8180694399, 9788180694394
2. Paul Longley, Geographical information systems, 2/e, Wiley, 1999,Digitised 2007, ISBN - 0471321826, 9780471321828

COURSE CODE:	COURSE NAME: **DATABASE TUNING**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
EBCS22E03	Prerequisite: DBMS	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

- The students will be able to tune the databases for different data base applications
- To develop case studies in data bases, and able to troubleshoot the data bases
- Identify the critical performance tuning steps

COURSE OUTCOMES (COs): Students will be able to

CO1	Remember the concepts of DBMS[L1]
CO2	Understand the fundamentals of Tuning. [L2]
CO3	Analyze the databases for different Applications[L4]
CO4	Apply the Troubleshoot ideas in the data bases [L3]
CO5	Develop Applications and Case Studies in data bases. [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**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**
CO2	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**2**
CO4	**2**	**3**	**3**	**2**	**1**	**2**	**2**	**3**	**2**	**3**	**3**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**3**	**3**	**2**
CO2	**1**	**3**	**3**	**2**
CO3	**2**	**3**	**3**	**3**
CO4	**2**	**2**	**2**	**1**
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
EBCS22E03	DATABASE TUNING	Ty	3	0/0	0/0	3

UNIT I Fundamentals of Tuning 9 Hrs

Review of Relational Databases – Relational Algebra - Locking and Concurrency Control – Correctness Consideration – Lock Tuning – Logging and the Recovery Subsystem – Principles of Recovery – Tuning the Recovery Subsystem – Operating Systems Considerations – Hardware Tuning

UNIT II Indexing and Hashing 9 Hrs

Types of Queries – Data Structures – B tree – B+ Tree - Hash Structures – Bit Map Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Hot Tables – Comparison of Indexing and Hashing Techniques

UNIT III Query Optimization 9 Hrs

Techniques - Tuning Relational Systems – Normalization – Tuning De-normalization – Clustering Two Tables – Aggregate Maintenance – Record Layout – Query Tuning – Triggers – Client Server Mechanisms – Objects, Application Tools and Performance – Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases

UNIT IV Troubleshooting 9 Hrs

Query Plan Explainers – Performance Monitors – Event Monitors – Finding ―Suspicious‖ Queries – Analyzing a Query ‘s Access Plan – Profiling a Query Execution – DBMS Subsystems

UNIT V Interface and Connectivity Tuning 9Hrs Objects, Application Tools and Performance –Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases – ODBC – JDBC Tuning ― Case Studies: Tuning E Commerce Application– Data Warehouse Tuning – Transaction Chopping

TOTAL HOURS: 45

TEXT BOOKS:

1.Dennis Shasha and Philippe Bonnet (2005) Database Tuning, Principles, Experiments, and Troubleshooting Techniques, Elsevier

2.Thomas Connoly and CarlolynBegg (2009) Database Systems, A Practical Approach to Design, Implementation and Management, (4th ed.) Pearson Education

REFERENCES:

1.Peter Gulutzan and Trudy Pelzer, ―SQL Performance Tuning, Addison-Wesley, First Edition, 2002.

COURSE CODE **EBCS22E04**	COURSE NAME: **COMPONENT BASED TECHNOLOGY**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Internet Programming	Ty	3	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

1. Study in depth JAVA, CORBA and .Net Components
2. Implement Fundamental properties of components, technology and architecture and middleware.
3. Understand Component Frameworks and Development.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the fundamentals of software components and their architecture (L1)
CO2	Develop a Java Thread and Create a bean for an application (L5)
CO3	Develop and Implement CORBA Based Technology Component (L5)
CO4	Apply .NET Based Technology Component for s/w development (L3)
CO5	Analyze Component Based connectors, development and testing Tools (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**	**1**	**1**	**1**	**2**	**1**	**2**	**2**	**1**	**1**	**1**
CO2	**3**	**2**	**3**	**1**	**2**	**2**	**1**	**2**	**2**	**3**	**3**	
CO3	**3**	**2**	**3**	**2**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	
CO4	**3**	**2**	**1**	**2**	**3**	**1**		**2**	**2**	**3**	**2**	
CO5	**2**	**3**	**1**	**2**	**3**	**1**		**2**	**1**	**2**	**2**	

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**2**	**1**	**1**
CO2	**3**	**3**	**1**	**2**
CO3	**3**	**3**	**2**	**3**
CO4	**2**	**3**	**2**	**3**
CO5	**1**	**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
EBCS22E04	COMPONENT BASED TECHNOLOGY	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION **9Hrs**

Software Components – objects – fundamental properties of Component technology – modules – interfaces – callbacks – directory services – component architecture – components and middleware

UNIT II JAVA BASED COMPONENT TECHNOLOGIES **9Hrs**

Threads – Java Beans – Events and connections – properties – introspection – JAR files – reflection – object serialization – Enterprise Java Beans – Distributed Object models – RMI and RMI-IIOP

UNIT III CORBA COMPONENT TECHNOLOGIES **9Hrs**

Java and CORBA – Interface Definition language – Object Request Broker – system object model – portable object adapter – CORBA services – CORBA component model – containers – application server – model driven architecture

UNIT IV NET BASED COMPONENT TECHNOLOGIES **9Hrs**

COM – Distributed COM – object reuse – interfaces and versioning – dispatch interfaces – connectable objects – OLE containers and servers – Active X controls – .NET components – assemblies – appdomains – contexts – reflection – remoting

UNIT V COMPONENT FRAMEWORKS AND DEVELOPMENT **9Hrs**

Connectors – contexts – EJB containers – CLR contexts and channels – Black Box {PAGE } component framework – directory objects – cross-development environment – component-oriented programming – Component design and implementation tools – testing tools – assembly tools.

Total Hours:45

TEXT BOOK

1.Clemens‖Szyperski,‖,Component‖Software: Beyond Object-Oriented Programming‘,‖Pearson‖Education‖publishers,‖2013

REFERENCES

1. Ed‖Roman,‖,Mastering‖Enterprise‖Java‖Beans‘,‖John‖Wiley‖&‖Sons‖Inc.,‖2012.
2. Mowbray,‖,Inside‖CORBA‘,‖Pearson‖Education,‖2013.
3. Freeze,‖,Visual‖Basic‖Development‖Guide‖for‖COM‖&‖COM+‘,‖BPB‖Publication,‖ 2011. 4. Hortsamann,‖Cornell,‖,CORE‖JAVA Vol-II‘‖,‖Sun‖Press,‖2012.

COURSE CODE: **EBCS22E05**	COURSE NAME: **E-COMMERCE**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Nil	Ty	3	0/0	0/0	3

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

OBJECTIVES:

The students should be made to

- Understand the nature of e-Commerce
- Recognize the business impact and potential of e-Commerce
- To Learn the E-Commerce Platform and its concepts
- To Understand the Technology, infrastructure and Business in E-Commerce
- To Understand the Security and Challenges in E-Commerce
- To Build an Own E-Commerce using Open Source Frameworks

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the concepts of E-commerce business models and strategy (L2)
CO2	Able to implement infrastructure for E-commerce and various services (L5)
CO3	Design and apply various protocols for wireless devices for M-commerce (L5)
CO4	Able to classify the technologies of Mobile commerce (L4)
CO5	Design and develop an E-Commerce model for enterprise (L5)

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

COs /PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**1**	**1**	**1**
CO2	**2**	**2**	**2**	**2**
CO3	**2**	**1**	**1**	**1**
CO4	**3**	**2**	**2**	**2**
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
EBCS22E05	**E-COMMERCE**	**Ty**	**3**	**0/0**	**0/0**	**3**

UNIT I Introduction **9Hrs**

History of E-Commerce -E-Commerce Vs E-Business-Emergence of the Internet- Advantages-Disadvantages- Business model- E –Business Models based on the relationship of Transaction Parties- E –Business Models based on the relationship of Transaction Types- Technologies of World Wide Web- Internet Client Server Applications- Networks and Internets-Software Agents-Internet Standards and Specification-Internet Service Provider-Markup Language and the web-JavaScript-XML-Intranets and Extranets.

UNIT II E-Marketing **9Hrs**

Identifying Web Presence Goals- The Browsing Behaviour Model-Online Marketing-E-Advertising-Internet Marketing Trends-Targets Markets-E-Branding-Marketing Strategies E-Security: Security on the Internet-E- Business Risk Management Issues-E-Payment Systems: Digital Token based e-payment System-Classification of New Payment System- Electronic Cash-Risk and E-Payment System-Designing E-paymentSystem- Digital Signature.

UNIT III E-Customer Relationship Management **9Hrs**

CRM-ECRM Solutions- ECRM Toolkit-Typical Business Touch point. E-Supply Chain Management-Supply Chain Management- Supply chain Management for Various Industries- E-Strategy and Knowledge management.

UNIT IV Mobile Commerce **9Hrs**

Information System for Mobile Commerce-Mobile Payments-Cellular Networks-Different Generations in wireless Communication- Technologies for mobile Commerce-WAP Programming Model. Portals for E-Business: Portals- Requirements of Intelligent Websites, Ethical, Social,Political issues in E-Commerce.

UNIT V Applications **9Hrs**

Plan your Business and create a web Site with wordpress.B2B ,B2C models of E-commerce.
Business model of any E-commerce website Mini project develop E-Commerce projects

Total Hours: 45

TEXT BOOK:

1. P.T. Joseph, S.J. (2015),E-Commerce Indian Perspective Fifth Edition, PHI Learning
2. Kenneth C.Laudon, Carol Guercio Traver-E-Commerce,Pearson,10th Edition,2016

REFERENCE BOOKS:

1.Zheng Qin(2009), Introduction to E-Commerce, Springer.
2.MamtaBhusry,E-Commerce, Laxmi Publications PVT Ltd.

COURSE CODE EBCS22E06	COURSE NAME: COMPUTER GRAPHICS AND MULTIMEDIA	Ty/Lb/ ETL/IE	L	T/S. Lr	P/ R	C
	Prerequisite: Nil	**Ty**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVES:

The students should be made to

- Understand the output primitives, two dimensional graphics and their transformations.
- Understand the three dimensional graphics and their transformations.
- Understand illumination and color models
- Learn to create animations
- To become familiar with Blender Graphics

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the various output primitives, transform geometrical structures and different shading, colour models[L2]
CO2	Understand and apply 2D transformations, viewing and clipping techniques [L2]
CO3	Apply the 3D objects concepts and projections and solving numerical problems on 3D transformation and polygon rendering methods[L3]
CO4	Understand the architecture, compression, decompression and different file formats involved in multimedia[L2]
CO5	Design and analyze basic shapes using Blender [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**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**		
CO2	**3**	**3**	**2**	**3**	**2**	**1**	**1**	**1**	**1**	**1**		
CO3	**3**	**3**	**2**	**3**	**2**	**1**	**1**	**1**	**1**	**1**		
CO4	**2**	**2**	**3**	**2**	**2**	**1**	**1**	**1**	**2**	**1**		
CO5	**2**	**2**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**		

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	**2**	**1**	**1**	**1**
CO2	**2**	**2**	**1**	**1**
CO3	**2**	**1**	**1**	**1**
CO4	**3**	**1**	**1**	**1**
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: COMPUTER GRAPHICS AND MULTIMEDIA	Ty/Lb/ ETL/IE	L	T/S. Lr	P/ R	C
EBCS22E06	Prerequisite: Nil	Ty	3	0/0	0/0	3

UNIT I BASICS OFCOMPUTER GRAPHICS AND COLOUR MODELS 9Hrs

Output primitives-Line drawing algorithms-Loading the frame buffer-Line function-Circle generation algorithms –Ellipse generation algorithms- Attributes of output primitives-Basic illumination models — halftone patterns and dithering techniques; Properties of light — Standard primaries and chromaticity diagram; Intuitive color concepts — RGB colour model — YIQ colour model — CMY colour model - colour selection

UNIT II TWO DIMENSIONAL GRAPHICS 9 Hrs

Two dimensional transformations- Matrix representations and homogeneous coordinates - Composite transformations – two dimensional viewing -Window to view port transformation - Clipping operations - Point clipping - Line clipping (Cohen - Sutherland line Clipping) - Polygon clipping(Sutherland - Hodgeman algorithm) –Numerical problem solving and programming on two dimensional transformation ,viewing and clipping

UNIT III THREE DIMENSIONAL GRAPHICS 9 Hrs

Three dimensional concepts - Three dimensional object representation -Three Dimensional Transformations - Visible surface detection methods (Back Face Detection - Depth Buffer Method - Scan Line Method) - Numerical problem solving and programming on three dimensional transformations

UNIT IV MULTIMEDIABASISANDTOOLS 9 Hrs

Multimedia basics – Multimedia applications – Multimedia system architecture – Evolving technologies for multimedia – Defining objects for multimedia systems – Multimedia data interface standards – Multimedia databases. Compression and decompression – Data and file format standards – Multimedia I/O technologies – Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval technologies.

UNIT V HYPERMEDIA 9 Hrs

Multimedia authoring and user interface — Hypermedia messaging -Mobile messaging – Hypermedia message component – Creating hypermedia message – Integrated multimedia message standards – Integrated document management – Distributed multimedia systems.

CASE STUDY: BLENDER GRAPHICS Blender Fundamentals — Drawing Basic Shapes — Modeling — Shading & Textures

Total Hours: 45

TEXT BOOKS:

1. **1.** Donald, D. Hearn. Pauline, Baker, M. Warren, Carithers. (2010) Computer graphics with Open GL, (4thed.)
2. **2.** Computer Graphics (Special Indian Edition) (Schaum's Outline Series) 2nd Edition, 2006 (English, Paperback, Xiang, Plastock, Avadhani), McGraw Hill Education (India) Private Limited

REFERENCE BOOKS:

1. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.

2. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: Principles and Practice", 3rd Edition, Addison- Wesley Professional,2013

COURSE CODE EBCS22E07	COURSE NAME: WIRELESS AND MOBILE NETWORKING	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

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

OBJECTIVES:

The students should be made to

- Understand the Communication Systems
- Analyze the mobile network issues

COURSE OUTCOMES (COs): Students will be able to

CO1	To understand about wireless communication[L2]
CO2	To know about the different architecture of cellular system[L4]
CO3	To understand various standards of wireless system[L2]
CO4	To analyze about the Mobile network issues[L4]
CO5	To know about Mobile network applications[L2]

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2
CO2	3	2	2	2
CO3	2	2	2	1
CO4	3	2	2	2
CO5	2	1	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
EBCS22E07	WIRELESS AND MOBILE NETWORKING	Ty	3	0/0	0/0	3

UNIT I COMMUNICATION FUNDAMENTALS 9Hrs

Introduction - Wireless Transmission - Frequencies for Radio Transmission - Signals - Signal propagation - Multiplexing, Modulation - Bandwidth-Spread spectrum - Cellular systems.

UNIT II MAC AND COMMUNICATION SYSTEMS 9Hrs

Functions of MAC - Interference -FDMA-TDMA-CDMA and OFDM. Telecommunication systems -GSM-UMTS and IMT-2000, Satellite systems - Broadcast systems - Data Digital Audio Broadcasting - Digital Video Broadcasting.

UNIT III WIRELESS STANDARDS 9Hrs Wireless LAN - Infrared vs. Radio Transmission - Infra structure and ad hoc Networks, 802.11, 802.15, MANET - HIPERLAN - Piconet. Wireless ATM - Services - Radio Access Layer - 3GPP,3G, 4G and 5G standards.

UNIT IV MOBILE NETWORK ISSUES 9Hrs

Mobile network layer - Mobile IP - DHCP - Mobile transport layer - Traditional TCP - Indirect TCP - Snooping TCP, Mobile TCP - Selective Retransmission - Transaction Oriented TCP, Routing Algorithm and protocols

UNIT V MOBILE APPLICATIONS 9Hrs

Support for Mobility - File systems - Consistency - World wide web - Hyper Text Transfer Protocol - Hypertext markup language –Next generation- Wireless Application Protocol. Over view of smart phones

Total Hours 45

TEXT BOOKS:

1. Jochen Schiller, (2008) Mobile Communications (2nd ed.), Pearson Education
2. Blake (2002) Wireless Communication Technology,Thomson Learning

REFERENCES

1. Theodore S.Rappaport (2010) Wireless Communication: Principles and practice, Prentice Hall.
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education.

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/IE : Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVE:

The students 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, 2ndedition, Prentice Hall of India, New Delhi, India.

PROGRAM ELECTIVE II

COURSE CODE **EBCS22E08**	COURSE NAME **: 5G NETWORKS**	**Ty/Lb/ ETL/I E**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Nil	**Ty**	3	0/0	0/0	3

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

OBJECTIVES:
The students should be made to

- Understand that the networks will deliver higher data speeds

Analyzing how to strengthening the communications infrastructure

COURSE OUTCOMES (COs): Students will be able to

CO1	To understand about 5G Architecture[L2]
CO2	To know about the machine type communication[L1]
CO3	To understand communication takes place in 5G[L2]
CO4	To analyze the features of 5G[L4]
CO5	To evaluate the mobility and dynamic configuration[L5]

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

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

URSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBCS22E08	**5G Networks**	**Ty**	3	0/0	0/0	3

Unit I **9 Hrs**

5G Architecture, Modeling requirements and scenarios, Channel model requirements, Propagation scenarios, NFV and SDN, Basics about RAN architecture , High-level requirements for the 5G architecture , Functional architecture and 5G flexibility , Enhanced Multi-RAT coordination features , 5G deployment.

Unit II **9 Hrs**

Machine-type communications- MTC requirements, Fundamental techniques for MTC , Data and control for short packets , Non-orthogonal access protocols , Massive MTC , Design principles , Technology components , Ultra-reliable low-latency MTC , Design principles , Technology components.

Unit III **9 Hrs**

Device-to-device (D2D) communications- D2D standardization: 4G LTE D2D , D2D in 5G: research challenges , Radio resource management for mobile broadband D2D , RRM techniques and concepts for mobile broadband D2D , RRM and system design for D2D , Multi-hop D2D communications for proximity and emergency services , Multi-operator D2D communication.

Unit IV **9 Hrs**

Millimeter wave communications- Channel propagation, Hardware technologies for mmW systems, Architecture and mobility, Beam forming, Physical layer techniques. 5G radio-access technologies - Access design principles for multi-user communications, Multi-carrier with filtering: a new waveform, Non-orthogonal schemes for efficient multiple access, Radio access for dense deployments, Radio access for V2X communication, Radio access for massive machine-type communication.

Unit V **9 Hrs**

Massive multiple-input multiple-output (MIMO) systems - Coordinated multi-point transmission in 5G - Relaying and wireless network coding - Interference management, mobility management, and dynamic reconfiguration.

Total Hours45

Text Books:

1. 5G Mobile and Wireless Communications Technology ,AfifOsseiran ,Ericsson , Josef. Monserrt, Universitat Politècnica de València , Patrick Marsch , Nokia , Second Edition 2011.
2. 5GNR: " The Next Generation Wireless Access Technology" ,Erik Dahlman, Stefan Parkvall, JohanSköld , Elsevier , First Edition ,2016.

References:

1.Fundamentalsof5GMobileNetworks ,Jonathan Rodriguez , Wiley , First edition 2010

COURSE CODE **EBCS22E09**	COURSE NAME**: INFORMATION STORAGE MANAGEMENT**	**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

- Understand the basic components of Storage System Environment.
- Understand the Storage Area Network Characteristics and Components.
- Examine emerging technologies including IP-SAN.
- Learn the architectures, features, and benefits of intelligent storage systems.
- Understand the various storage infrastructure components in data center environments.

COURSE OUTCOMES (COs): Students will be able to

CO1	Determine storage requirements for a data center. [L1]
CO2	Evaluate the performance of storage subsystems. [L5]
CO3	Design storage solutions based on application needs. [L6]
CO4	Define backup, recovery, disaster recovery, business continuity, and replication. [L1]
CO5	Understand logical and physical components of a storage infrastructure[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**	**3**	**2**	**2**	**1**	**2**	**2**	**3**	**3**	**3**
CO2	**3**	**2**	**3**	**3**	**1**	**1**	**2**	**1**	**2**	**3**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**2**	**1**	**1**	**2**	**2**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**
CO5	**3**	**2**	**3**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**2**	**3**
CO3	**3**	**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
EBCS22E09	INFORMATION STORAGE MANAGEMENT	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO STORAGE SYSTEMS 9 Hrs

Information Storage - Evolution of Storage Technology and Architecture – Data Centre – Infrastructure – ILM – Storage System Environment -Components of Host RAID: Implementation, RAID Array Components-RAID levels & comparison –RAID Impact On Disk Performance- ISS- Components, Intelligent Storage Array.

UNIT II STORAGE NETWORKING TECHNOLOGIES 9 Hrs

Direct-Attached Storage- Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces-Introduction to Parallel SCSI, SCSI Command Model-Storage Area Networks- Fiber Channel, SAN Evolution, SAN Components, Fiber Channel Connectivity, Fiber Channel Ports, Fiber Channel Architecture, Zoning, Fiber Channel Login Types, Fiber Channel Topologies-NAS-Benefits, NAS File me /Components and Operations, Implementations, File Sharing Protocols.

UNIT III VIRTUALIZATION AND ADVANCED STORAGE NETWORKING 9 Hrs

IP SAN: iSCSI, FCIP. Content-Addressed Storage: Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples. Storage Virtualization: Forms of Virtualization, NIA Storage Virtualization Taxonomy, Storage Virtualization Configurations, Storage Virtualization Challenges, Types of Storage Virtualization.

UNIT IV BUSINESS CONTINUITY AND STORAGE SECURITY 9 Hrs

Information availability – BC Planning Life Cycle, failure analysis, Business Impact Analysis – Backup & Recovery –Purpose and Considerations-Restoration operations-Backup Topologies and Technologies.

UNIT V LOCAL AND REMOTE REPLICATION 9 Hrs

Local Replication: Source and Target, Uses, Data Consistency, Local Replication Technologies, Restore and Restart Considerations, Creating Multiple Replicas, Management Interface.
Remote Replication: Modes of Remote Replication and its Technologies, Network Infrastructure.

Total Hours: 45

TEXT BOOKS:

1. EMC Corporation, Information Storage and Management, Wiley India, 2nd edition 2012
2. G.Somasundaram, A.Shrivastava, "Information Storage and Management: Storing, Managing and Protecting Digital Information in Classic, Virtualized and Cloud Environment", 2nd Edition, Wiley publication, 2012.

REFERENCE BOOKS:

1. Robert Spalding, ―Storage Networks: The Complete Reference ―, Tata McGraw Hill, Osborne, 2003.
2. Meeta Gupta, Storage Area Networks Fundamentals, Pearson Education Limited, 2002.
3. Marc Farley, ―Building Storage Networks‖, Tata McGraw Hill, Osborne, 2001.

COURSE CODE: EBCS22E10	COURSE NAME: RISK MANAGEMENT	Ty/Lb/ ETL/IE	L	T/ S. Lr	P/ R	C
	Prerequisite: NIL	Ty	3	0/0	0/0	3

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

OBJECTIVES:

The students should be made to:

- Identify and categories the various risks face by an organization
- Explain the various risk control measures available
- Design a risk management program for a business organization.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the various risks face by an organization (L1)
CO2	Able to applying various risk control measure to the suitable risk organization (L3)
CO3	Demonstrating the knowledge of financial and financial related risks facing Organizations (L3)
CO4	Able to analyzing a risk management program for an organization (L4)
CO5	Design a risk management program for a business organization. (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	3	2	2	2	2	2	2	1	1	
CO2	2	2	2	1	3	3	2	1	2	1	1	1
CO3	3	2	2	1	1	1	1	1	1	2		
CO4	2	3	2	1	2	2	3	1	1			1
CO5	3	3	3	2	3	2	1	1	1		1	1

COs / PSOs	PSO1	PSO2	PO3	PSO4
CO1	3	2	3	2
CO2	3	2	3	3
CO3	3	1	3	3
CO4	3	3	1	1
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
EBCS22E10	RISK MANAGEMENT	Ty	3	0/ 0	0/ 0	3

UNIT I: The Risk Management Process **9Hrs**

Introduction to software risk management, why do we need to manage risk in software development, Use, Objectives, Risk Management Paradigm, Risk management and litigation. Models for Risk Management.

UNIT II: Discovering Risk In Software Development **9Hrs**

Risk attributes and Identification, Identifying software risk, Common software project risks, Risk Taxonomy, Risk Mapping, statements, reviews., Risk ownership and stakeholder management.

UNIT III: Risk Assessment **9Hrs**

Objectives and goals. Approach to assessment, Risk assessment tools and techniques, presenting the risk findings.

UNIT IV: Planning Risk Mitigation Strategies **9Hrs**

Risk Planning, Best practices in the risk planning, Risk management tools, Risk mitigation strategies, Formulating and Implementing risk management plans.

UNIT V: Monitoring Risk in Software Projects **9Hrs**

Developing a process for monitoring risk, formulating a project risk database, Managing and tracking risk, Risk support tools. Software Risk Metrics, organization, estimation, development methodology.

Total Hours: 45

TEXT BOOKS:

1. Yacov Y. Haimes, (2011) Risk Modeling, Assessment, and Management, Wiley
2. John Mcmanus,(2004) Risk Management in software development projects, Elsevier Butterworth- Heinemann

REFERENCE BOOKS:

1. Martin Loosemore, John Raftery, (2006) Risk management in projects,Taylor& Francis Ltd
2. Ravindranath P. C, (2007) Applied Software Risk Management, Auerbach,
3. Dale Walter Karolak,,(1995) Software engineering risk management, Wiley-Ieee Computer Society

COURSE CODE:	COURSE NAME: **CRYPTOGRAPHY AND NETWORK SECURITY**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
EBCS22E11	Prerequisite: COMPUTER NETWORKS	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 student will be able

- Understand OSI security architecture and classical of modern cryptography.
- To gain knowledge onPublic Key Cryptography.
- Understand various block cipher modes.
- Understands the principles of public key cryptosystems, and different message authentication and integrity techniques

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities [L2]
CO2	Apply the different cryptographic operations of symmetric and Asymmetric cryptographic algorithms[L3]
CO3	To design, analyze and implement different network security protocols [L4]
CO4	Apply the various Authentication schemes to simulate different applications[L3]
CO5	Understand various Security practices and System security standards[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**	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**1**
CO2	**3**	**2**	**3**	**2**	**3**	**1**	**2**	**1**	**2**	**1**	**1**	**1**
CO3	**3**	**3**	**3**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**1**
CO4	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**2**
CO5	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**2**	**3**
CO2	**3**	**1**	**1**	**3**
CO3	**3**	**1**	**2**	**3**
CO4	**3**	**2**	**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/	L	T/S.Lr	P/R	C
EBCS22E11	CRYPTOGRAPHY AND NETWORK SECURITY	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO MODERN CRYPTOGRAPHY 9Hrs

OSI security architecture - Security attacks, Services and Mechanisms - -Network security model-Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

NUMBER THEORY: Modular arithmetic-Euclid's algorithm- Fermat's and Euler's theorem- The Chinese remainder theorem- Discrete logarithms.

UNIT II SYMMETRIC KEY CIPHERS 9Hrs

SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard – RC4 –Key distribution.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9Hrs

Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange--Elliptic curve cryptography.

UNIT IV CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS 9Hrs

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols-DSS.

UNIT V NETWORK SECURITY AND SYSTEM SECURITY 9 Hrs

Authentication Applications –Pretty Good Privacy – S/MIME – IP Security – Web Security.Intruders – Intrusion Detection– Malicious Software – Viruses and Related Threats -Viruses Countermeasures – Distributed Denial of Service Attacks - Firewalls – Firewall Design Principles – Trusted Systems.

Total Hours: 45

TEXT BOOK:

1. William Stallings (2011) Cryptography And Network Security – Principles and Practices, (5th ed.) Pearson Education.

REFERENCE BOOKS:

1. Atul Kahate (2008) Cryptography and Network Security Tata McGraw Hill
2. Bruce Schneier (2007) Applied Cryptography, John Wiley & Sons Inc.
3. Charles B. Pfleeger, Shari Lawrence Pfleeger (2007) Security in Computing (4th ed.), Pearson Education

COURSE CODE **EBCS22E12**	**MOBILE ADHOC NETWORKS**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Nil	Ty	3	0/0	0/0	3

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

OBJECTIVES:

The students should be made to

- Understands the most recent research and development in the rapidly growing area of ad hoc networks.
- Analyze and understands the ad hoc networking trends, possible architectures, and the advantages/limits for future commercial, social, and educational applications.
- Develop many products that fully utilize the ad hoc technology that are being widely deployed throughout the world.

COURSE OUTCOMES (COs): Students will be able to

CO1	Create instant wireless networks for conventions, conferences, emergency situations, educational or military uses, and more [L6]
CO2	Build wireless community networks where little or no infrastructure exists [L6]
CO3	To Integrate wireless multihop relaying technologies with existing wireless LAN technologies[L4]
CO4	To Deliver QoS for multimedia and other functions in untethered nets [L3]
CO5	Translate the IETF MANET standards into practical terms [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**	**3**	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**2**
CO2	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**2**
CO3	**2**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**
CO4	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO5	**2**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

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

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

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

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBCS22E12	MOBILE ADHOC NETWORKS	Ty	3	0/0	0/0	3

UNIT I **9 Hrs**

Introduction- Adhoc networks. Mobile Ad-Hoc networking with a View of 4G Wireless, Off-the-Shelf Enables of Ad Hoc, IEEE 802.11 in Ad Hoc Networks:

UNIT II **9 Hrs**

Protocols, Performance and Open Issues, Scatter net Formation in Bluetooth Networks , Antenna Beam forming and Power Control for Ad Hoc Networks, Topology Control in Wireless Ad Hoc Networks, Broadcasting and Activity Scheduling in Ad Hoc Networks.

UNIT III **9 Hrs**

Location Discovery, Routing Approaches in Mobile Ad Hoc Networks, Energy-Efficient Communication in Ad Hoc Wireless, Ad Hoc Networks Security, Self-Organized and Cooperative Ad Hoc Networking.

UNIT IV **9 Hrs**

Simulation and Modeling of Wireless, Mobile, and Ad Hoc Networks, Modeling Cross-Layering Interaction Using Inverse Optimization Algorithmic Challenges in Ad Hoc Networks

UNIT V **9 Hrs**

Sensor Networks Introduction to sensor network, Unique constraints and challenges, Localization and Tracking, Networking Sensors, Infrastructure establishment, Sensor Tasking and Control, Sensor network databases, Sensor Network Platforms and tools, Industrial Applications and Research directions.

Total Hours: 45

TEXT BOOKS:

1. Mobile Adhoc Networks – Aggelou , George (McGraw-Hill).
2. Mobile Adhoc Networking – Stefano Basagni (Editor), Marco Conti (Editor), Silvia Giordano (Editor), Ivan Stojmenovi&Cacute (Editor) (Wiley-IEEE Press).

REFERENCE BOOKS:

1.Mobile Ad Hoc Networks 2009 George AggelouMcGraw Hill Education
2. Mobile Ad Hoc Networking: Cutting Edge Directions (IEEE Series on Digital & Mobile Communication) Hardcover – Import, 26 March 2013 Stefano Basagn

COURSE CODE: EBCS22E13	COURSE NAME: NETWORK INFRASTRUCTURE MANAGEMENT	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: Computer Networks	Ty	3	0/0	0/0	3

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

OBJECTIVE:
The students should be made to

- To learn Network Layers functionality, to acquire knowledge about VLANs, and to test Network security and wireless security.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Recall the concepts of computer networks
CO2	Outline the use of network infrastructure
CO3	Recognize the importance and relevance of VLANs and EIGRP
CO4	Analyze and solve the problems in the network infrastructure
CO5	Compare and contrast various network infrastructures

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	2	3	1	3	3	3	3	2
CO2	3	2	1	2	2	3	2	1	3	3	3	2
CO3	3	2	2	3	2	3	2	2	3	2	3	2
CO4	3	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	2	3	2	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	3	3	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: EBCS22E13	COURSE NAME: NETWORK INFRASTRUCTURE MANAGEMENT	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: Computer Networks	**Ty**	**3**	**0/0**	**0/0**	**3**

UNIT I INTERNETWORKING & IP ADDRESSING 9Hrs

Internetworking Models – Layered Approach – OSI Reference Models – Ethernet Networking – Cabling – Data Encapsulation – Three Layer Hierarchical model – core layer – distribution layer – Access layer – TCP/IP and DoD Model – IP Addressing – Hierarchical IP Addressing scheme - Broadcast Address.

UNIT II SUBNETTING, VLSM AND IOS 9Hrs

Subnetting basics – CIDR – VLSM Design – Summarization – Troubleshooting IP Addressing – IOS user interface – CLI – Router and switch Administrative Configuration – Router Interfaces – viewing, saving, and erasing configuration

UNIT III MANAGING INTERNETWORK AND IP ROUTING 9Hrs

Internal component of a Router – routing boot sequence – configuration register – backing up and restoring configuration – CDP – resolving hostnames – Checking network connectivity – IP routing basics – Static routing – default routing – dynamic routing – RIP – IGRP

UNIT IV EIGRP, OSPF, STP AND VLANS 9Hrs

EIGRP features – RTP – DUAL – EIGRP to support large Networks –Configuring EIGRP - Load balancing – OSPF terminology – Configuring and verifying OSPF – DR and BDR elections – Loopback interfaces – troubleshooting – STP spanning tree terms and operations – VLANs Basics – memberships – VTP – Configuring VLAN – Inter VLAN routing.

UNIT V ACLS, NAT AND WIRELESS TECHNOLOGIES 9Hrs

Access Lists, VTY access, advanced Access List, Named ACLs, monitoring Access List, configuring access list – NAT names – PAT configuration – NAT using SDM – Wireless technologies – Unified wireless solutions – split MAC architecture – MESH and LWAPP - wireless security

Total Hours: 45

TEXT BOOKS:

1. Todd Lammle, 2011 “CCNA Cisco Certified Network Associate study guide – Wiley India.
2. Brian Hill, 2013 “The complete Reference - Cisco ” Tata McGraw-Hill.

REFERENCE BOOKS:

1. Richard Deal, 2013 “CCNA Cisco Certified Network Associate study guide” Tata McGraw-Hill.
2. Steven Latre et al 2015 “Intelligent Mechanism for Network Component and Security” Springer.

COURSE CODE EBCS22E14	COURSE NAME: CYBER FORENSICS AND INTERNET SECURITY	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: OS, Data Structure, Networking, Web Technology	Ty	3	0/0	0/0	3

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

OBJECTIVES:

The students should be made to

- To learn the computer forensic fundamentals
- To understand various types of cyber crime activities involved in the digital world
- To study various network security technologies to prevent the data from hacker or intruder

COURSE OUTCOMES (COs): Students will be able to

CO1	Understanding how to protect the data/secure their personal and official data in computer.
CO2	Analyze the cyber crimes using digital forensics
CO3	Enable data security in the network using network security technologies.
CO4	Apply the knowledge to find the frauds with help of case study
CO5	Analyze various internet security techniques

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

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

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

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

COURSE CODE	COURSE NAME: CYBER FORENSICS AND INTERNET SECURITY	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBCS22E14	Prerequisite: NIL	Ty	3	0/0	0/0	3

UNIT I Cyber Forensics **9Hrs**

Introduction to Cyber Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimes and modules.

UNIT II Cyber Forensic systems **9Hrs**

Understanding Computer components- input and output devices, CPU, Digital Media, System software - Operating System Architecture, Application Software, File Systems, Memory organization concept, Data Storage concepts. Network: Topology, Devices, Protocols and Port, Communication media. IP Address: Types and classes.

9Hrs

UNIT III Cyber Attacks

Ethical hacking, Attack Vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems associated with Computer Crimes, Realms of Cyber world, brief history of the internet, contaminants and destruction of data, unauthorized access, computer intrusions, white-collar crimes, viruses and malicious code, virus attacks, pornography, software piracy, mail bombs, exploitation, stalking and obscenity in internet, Cyber psychology, Social Engineering.

UNIT IV Digital Forensic **9Hrs**

Introduction to Digital forensics, Forensic software and handling, forensic hardware and handling, analysis and advanced tools, forensic technology and practices, Biometrics: face, iris and fingerprint recognition, Audio-video evidence collection, Preservation and Forensic Analysis.

UNIT V Internet Security **9Hrs**

E-mail Security, Pretty Good Privacy (PGPs) / MIME, IP Security, Access and System Security, Intruders, Intrusion Detection and Prevention, Firewall, Hardware Firewall, Software Firewall, Application Firewall, Packet Filtering. , Packet Analysis, Proxy Servers, Firewall setting in Proxy, ACL in Proxy.

Total Hours:45

TEXT BOOKS:

1. John R. Vacca, (2005) Computer Forensics: Computer Crime Scene Investigation, 2nd Edition, Charles River Media.
2. Man Young Rhee, (2003) “Internet Security Cryptographic Principles, Algorithms and Protocols”, WILEY.

REFERENCE BOOKS:

1. William Stallings, “Cryptography and Network Security: Principles and Standards”, Prentice Hall India, 3rd Edition, 2003
2. Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series: Computer Forensics), 2010
3. Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, 2nd Edition, Springers, 2010**.**

COURSE CODE: **EBCS22E15**	COURSE NAME: **DATABASE 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/IE : Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- To provide a foundation in database security
- Understand the various database vulnerabilities
- Learn to audit the databases.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the fundamentals of security process[L2]
CO2	Analyze the different database perspective and vulnerabilities in operating system[L4]
CO3	Apply the security policies and techniques[L3]
CO4	Understand and apply various Database Application in Security Models[L2]
CO5	Able to develop the database project in real time process[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**	**1**	**2**	**1**	**1**	**1**				**1**	**1**
CO2	**3**	**2**	**3**	**2**	**1**	**1**	**2**				**1**	**1**
CO3	**3**	**2**	**2**	**2**	**1**	**1**	**2**				**1**	**1**
CO4	**3**	**3**	**3**	**2**	**2**	**2**	**1**				**2**	**2**
CO5	**3**	**3**	**2**	**2**	**2**	**1**	**2**				**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/S.Lr	P/R	C
EBCS22E15	DATABASE SECURITY	Ty	3	0/0	0/0	3

UNIT I Security Architecture & Operating System Security Fundamentals 9Hrs

Security Architecture: Introduction-Information Systems- Database Management Systems-Information Security Architecture- Database Security–Asset Types and value-Security Methods Operating System Security Fundamentals: Introduction-Operating System Overview-Security Environment – Components- Authentication Methods-User Administration-Password Policies-Vulnerabilities-E-mail Security.

UNIT II Administration of Users, Profiles, Password Policies, Privileges and Roles 9 Hrs

Administration of Users: Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices Profiles, Password Policies, Privileges and Roles: Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles-Best Practices.

UNIT III Database Application Security Models 9 Hrs

Introduction-Types of Users-Security Models: Access Matrix model, Access mode model- DBMS Design Security Packages-Statistical Database Protection & Intrusion Detection Systems-Application Types: Client/Server Applications, Web Applications, Data ware house applications- Application Security Models-Data Encryption.

UNIT IV Virtual Private Databases 9 Hrs

Virtual Private Databases: Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and Column level Security with SQL Server.

UNIT V Auditing Database Activities and Project Cases 9 Hrs

Using Oracle Database Activities-Creating DLL Triggers with Oracle - Auditing Database Activities with Oracle-Auditing Server Activity with SQL Server 2000-Security and Auditing Project Case Study - Case Studies : Developing an online database, payroll management, tracking database changes, developing a secured authorization repository.

Total Hours: 45

TEXT BOOK:

1. Hassan A. Afyouni, 2009 “Database Security and Auditing”, Third Edition, Cengage Learning.

REFERENCE BOOKS:

1. Charu C. Aggarwal, Philip S Yu, 2008, “Privacy Preserving Data Mining”: Models and Algorithms, Kluwer Academic Publishers.
2. Ron Ben Natan, 2005, ”Implementing Database Security and Auditing”, Elsevier Digital Press.

COURSE CODE **EBCS22E16**	COURSE NAME**:** **MANAGEMENT INFORMATION 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/IE : Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Evaluate the role of the major types of information systems in a business environment and their relationship to each other;
- Assess the impact of the Internet and Internet technology on business electronic commerce and electronic business;
- Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the basic concepts and technologies used in the field of management information systems (L1)
CO2	Apply the role of the ethical, social, and security issues of information systems. (L3)
CO3	To Understand about the Business Model (L1)
CO4	Apply the understanding of how various Consumer Oriented Applications are like DBMS work together to accomplish E-Commerce. (L3)
CO5	Implement EDI (Electronic Data Interchange) (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**	**2**	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	
CO2	**2**	**3**	**3**	**2**	**3**	**1**	**2**	**2**	**1**		**1**	
CO3	**3**	**2**	**3**	**2**	**3**	**2**	**1**	**3**	**2**	**1**	**1**	
CO4	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**1**				**1**
CO5	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**				

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**1**	**2**
CO2	**3**	**2**	**2**	**2**
CO3	**2**	**3**	**2**	**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
EBCS22E16	MANAGEMENT INFORMATION SYSTEMS	Ty	3	0/0	0/0	3

UNIT I : FUNDAMENTALS OF INFORMATION SYSTEMS 9 Hrs

Information systems in business- Fundamentals of information systems-Solving business problems with information systems-Business Information systems- Transaction processing systems-Management Information Systems and Decision Support Systems-Artificial intelligence technologies in business-Information system for strategic applications and Issues in Information Technology.

UNIT II: ISSUES IN MANAGING INFORMATION TECHNOLOGY 9 Hrs

Managing Information Resources and Technologies-Global Information Technology, Management, Planning and Implementing Change- Integrating Business change with IT-Security and Ethical challenges in managing IT-Social challenges of Information Technology.

UNIT III: INTRODUCTION TO E-BUSINESS 9 Hrs

E-commerce frame work, Media convergence, Consumer applications, Organization applications-BUSINESS MODEL: Architectural frame work for E-commerce, Application services and transaction Models – B2C Transactions, B2B Transactions- Intra-Organizational Transactions- WWW Architecture: Client server structure of the web- E-Commerce Architecture-Technology behind the web.

UNIT IV: CONSUMER-ORIENTED E-COMMERCE 9 Hrs

Consumer oriented Application: Finance and Home Banking- Home shopping-Home Entertainment, -Mercantile Process Models-Consumers perspective- Merchants perspective.

UNIT V: ELECTRONICS DATA INTERCHANGE (EDI) 9 Hrs

EDI Concepts, Applications in business – components of international trade, Customs Financial EDI, Electronic fund transfer, Manufacturing using EDI, Digital Signatures and EDI.

Total Hours: 45

TEXT BOOKS:

1. Management Information Systems- Managing Information Technology in the internet worked Enterprise- James. A O'Brien - Tata McGraw Hill publishing company limited, 2002.
2. Management Information Systems - Laaudon& Laudon PHI ISBN 81-203-1282-1.1998.

REFERENCES:

1. Management Information systems- S. Sadogopan.PHI 1998Edn. ISBN 81-20311809
2. Information systems for modern management - G.R. Murdi

PROGRAM ELECTIVE-III

COURSE CODE	COURSE NAME: MOBILE APPLICATION DEVELOPMENT	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBCS22E17	Prerequisite: Operating System, Computer Graphics, Computer Networks and Web 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/IE : Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Describe the limitations and challenges of working in a mobile and wireless environment
- Describe and apply the different types of application models/architectures used to develop mobile software applications.
- Describe the components and structure of a mobile development frameworks

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

CO1	Able to remember the various Mobile Platforms and analyze its architectures
CO2	Understand and develop various Mobile Applications for Android and Apple
CO3	Apprehend the design and develop own mobile application
CO4	Apply the different types of application models and architectures
CO5	Analyze the concepts of various mobile services

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3
CO2	3	2	2	3
CO3	3	3	2	2
CO4	2	2	3	3
CO5	2	3	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: MOBILE APPLICATION DEVELOPMENT	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBCS22E17	Prerequisite: Operating System, Computer Graphics, Computer Networks and Web Design	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION **9 Hrs**

Introduction to Mobile Platforms – Exploring Android Platform – Android Studio, Java, XML – Exploring Apple IPhone Platform – XCode, Objective C, Swift – Options for development, Mobile Software Engineering

UNIT II USER INTERFACE DEVELOPMENT **9 Hrs**

UI Elements – Frameworks and Tools - Generic UI Development – VUIs and Mobile Apps - Designing the Right UI - Multichannel and MultimodialUIs - Layouts – Android Intents and Services - Gesture based interfaces –Styles & Themes.

UNIT III GOOGLE ANDRIOD PLATFORM **9 Hrs**

Characteristics of Mobile Applications - Google Application Architecture – Basic Building Blocks - The Android Emulator – Event based programming – SQLite Database Access – ADB – Mobility and Location Based Services

UNIT IV APPLE IPHONE PLATFORM **9 Hrs**

UI Kit for Interfaces - Understanding basics of Swift - Application development using Swift - Understanding basics of Objective – C - App development using Objective – C– SQLite Database Access – Application Debugging – Location Handling

UNIT V IMPLEMENTING SOFTWARE AS A SERVICE **9 Hrs**

Service Oriented Computing Examples – Google Maps – Enabling Map based services in Application – Amazon Web Services – Exploring AWS S3 & AWS IoT APIs. Case studies on Mobile Application

Total Hours: 45

TEXT BOOKS:

1. Ed Burnette (2015) Hello, Android: Introducing Google's Mobile Development Platform, 4th edition, Pragmatic Bookshelf.
2. Marko Gargenta (2011) Learning Android, O'Reilly Media.

REFERENCE BOOKS:

1. Richard Rodger (2012) Beginning Mobile application development in the cloud, Wrox Publication.
2. Jonathan A. Zdziarski (2008), iPhone Open Application Development, 2nd edition, O'Reilly Media Publication.

COURSE CODE **EBCS22E18**	COURSE NAME: **DATA SCIENCE**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/ R**	**C**
	Prerequisite: Nil	Ty	3	0/0	0/0	3

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

OBJECTIVES:

The students should be made to

- know the fundamental concepts of data science and analytics
- learn various techniques for mining data streams
- learn Event Modeling for different applications.
- know about Hadoop and Map Reduce procedure

COURSE OUTCOMES (COs): Students will be able to	
CO1	Understand the application and process of data science[L2]
CO2	Analyzing the different models with examples[L4]
CO3	Applying various techniques for data mining[L3]
CO4	Write and evaluate efficient algorithms for mining the data from large volumes[L5]
CO5	Understand and apply different Frameworks and Visualization techniques for Real world 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	2	2	1	1	1				1	1
CO2	3	3	3	2	1	1	2				1	1
CO3	3	3	2	2	1	1	2				1	1
CO4	3	3	2	2	2	2	1				2	2
CO5	3	3	2	2	2	1	2				1	1

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

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

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

COURSE CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBCS22E18	DATA SCIENCE	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO DATA SCIENCE AND BIG DATA 9 HRS

Introduction to Data Science – Applications - Data Science Process – Exploratory Data analysis – Collection of data – Graphical presentation of data – Classification of data – Storage and retrieval of data – Big data – Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II DATA ANALYSIS 9 HRS

Correlation – Regression – Probability – Conditional Probability – Random Variables – Analysis using Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis- Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics.

UNIT III DATA MINING TECHNIQUES 9 HRS

Rule Induction - Neural Networks: Learning and Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods- Neuro-Fuzzy Modelling – Association rule mining – Clustering – Outlier Analysis – Sequential Pattern Mining – Temporal mining – Spatial mining – Web mining.

UNIT IV MINING DATA STREAMS 9 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 - Real time Analytics Platform (RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT V FRAMEWORKS AND VISUALIZATION 9 HRS

Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – Cloud databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques – Social Network Analysis – Collective Inferencing – Egonets - Systems and Applications.

Total Hours: 45

TEXT BOOKS:

1.Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2.Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
3.Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
4.Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

REFERENCES BOOKS:

1. Rachel Schutt, Cathy O'Neil, “Doing Data Science”, O'Reilly Publishers, 2013.
2. Foster Provost, Tom Fawcet, “Data Science for Business”, O'Reilly Publishers, 2013.
3. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications“, Wiley Publishers, 2014.
4. S. N. Sivanandam, S. N Deepa, “Introduction to Neural Networks UsingMatlab 6.0”, Tata McGraw- Hill Education, 2006.

COURSE CODE **EBCS22E19**	COURSE NAME: **EMBEDDED SYSTEMS ARCHITECTURES**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Nil	Ty	3	0/0	0/0	3

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

OBJECTIVES:

The students should be made to

- Understand the basics of an embedded system.
- Understand the typical components of an embedded system.
- To understand different communication interfaces.
- To learn the design process of embedded system applications.
- To understands the RTOS and inter-process communication

COURSE OUTCOMES (COs): Students will be able to

CO1	To understand the basics of Embedded System (L1)
CO2	Able to design processor and memory for Embedded systems (L5)
CO3	To develop an Embedded Firmware (L5)
CO4	To identify best operating system for embedded system (L4)
CO5	To apply the basic task Communication (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**	**3**	**3**	**3**	**2**	**1**				**1**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**1**			
CO3	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**1**	**1**		**1**	
CO4	**3**	**3**	**2**	**2**	**2**	**2**	**2**			**1**		
CO5	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**1**		**2**		

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**3**	**2**
CO2	**3**	**2**	**3**	**2**
CO3	**3**	**2**	**2**	**2**
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 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
EBCS22E19	EMBEDDED SYSTEMS ARCHITECTURES	Ty	3	0/0	0/0	3

UNIT I **9 Hrs**

Introduction to Embedded Systems: Definition of Embedded System, Embedded SystemsVs General Computing Systems, History of Embedded Systems, Classification, MajorApplication Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT II **9 Hrs**

Typical Embedded System: Core of the Embedded System: General Purpose and DomainSpecific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface:Onboard and External Communication Interfaces.

UNIT III **9 Hrs**

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, RealTime Clock, Watchdog Timer, Embedded Firmware Design Approaches and DevelopmentLanguages.

UNIT IV **9 Hrs**

RTOS Based Embedded System Design: Operating System Basics, Types of OperatingSystems, Tasks, Process and Threads, Multi processing and Multitasking, Task Scheduling.

UNIT V **9 Hrs**

TASK COMMUNICATION: Shared Memory, Message Passing, Remote Procedure Calland Sockets, Task Synchronization: Task Communication/Synchronization Issues, TaskSynchronization Techniques, Device Drivers, How to Choose an RTOS.

Total Hours:45

TEXT BOOKS:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS:

1.Embedded Systems - Raj Kamal, TMH.
2.Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3.Embedded Systems – Lyla, Pearson, 2013.
4.An Embedded Software Primer - David E. Simon, Pearson Education.

COURSE CODE **EBCS22E20**	COURSE NAME**:** **AGILE SOFTWARE 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/IE : Theory/Lab/Embedded Theory and Lab/Internal Evaluation

OBJECTIVES:

The students should be made to

- Understand the theoretical as well as practical aspects of agile software development practices and how small teams can apply them to create high-quality software.
- Understanding of software design and a set of software technologies and APIs.
- do a detailed examination and demonstration of Agile development and testing techniques.
- Understand the benefits and pitfalls of working in an Agile team.
- Understand Agile development and testing.

COURSE OUTCOMES (COs): Students will be able to

CO1	Analyze existing problems with the team, development process and wider organization[L4]
CO2	Apply a thorough understanding of Agile principles and specific practices[L3]
CO3	Understand and apply the most appropriate way to improve results for a specific circumstance or need[L2]
CO4	Analyze and apply appropriate adaptations to existing practices or processes depending upon analysis of typical problems[L4]
CO5	Evaluate likely successes and formulate plans to manage likely risks or problems[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**	**3**	**2**	**1**	**1**	**1**		**1**		**1**	**1**
CO2	**3**	**3**	**3**	**2**	**1**	**1**	**2**		**1**		**1**	**1**
CO3	**3**	**2**	**3**	**2**	**1**	**1**	**2**		**1**		**1**	**1**
CO4	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**		**2**	**2**
CO5	**3**	**3**	**2**	**2**	**2**	**1**	**2**	1	**1**		**1**	**1**

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
EBCS22E20	AGILE SOFTWARE DEVELOPMENT	Ty	3	0/0	0/0	3

UNIT AGILE DEVELOPMENT **9 Hrs**

Agile Practices, Overview of Extreme Programming, Planning, Testing, Refactoring, A Programming Episode.

UNIT II AGILE DESIGN **9 Hrs**

What is Agile Design? SRP: The Single-Responsibility Principle, OCP: The Open-Closed Principle, LSP: The Liskov Substitution Principle, DIP: The Dependency-Inversion Principle, ISP: The Interface-Segregation Principle.

UNIT III THE PAYROLL CASE STUDY **9 Hrs**

Command and Active Object, Template Method & Strategy: Inheritance vs Delegation, Facade and Mediator, Singleton and Monostate, Null Object, The payroll Case Study: Iteration One Begins, The Payroll Case Study: Implementation.

UNIT IV PACKAGING THE PAYROLL SYSTEM **9 Hrs**

Principles of Package Design, Factory, The Payroll Case Study (part 2)

UNIT V THE WEATHER STATION CASE STUDY **9 Hrs**

Composite, Observer-Backing into a Pattern, Abstract Server, Adapter, and Bridge, Proxy and Stairway To Heaven: Managing Third Party APIs, Case Study: Weather Station.

Total Hours: 45

TEXT BOOKS:

1. “Agile Software Developement principles, Patterns and Practices” by Robert C. Martin, 1st edition 2003.

REFERENCE BOOKS:

1."Agile Software Developement" by Thomas Uwe Hansmann, Springer-Verlag Berlin Heidelberg 2010.

2. "The Art of Agile Developement" by James Shore & Shane Warden 2006

COURSE CODE **EBCS22E21**	COURSE NAME **:** **FOUNDATION OF ROBOTICS AUTOMATION**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Nil	**Ty**	3	0/0	0/0	3

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

OBJECTIVES:

The students should be made to

- Understand the concepts of automation
- Apply the software automation concepts in real world
- Design usecases for any software programs
- Analyze the software testing models

COURSE OUTCOMES (COs) : Students will be able to

CO1	Remember the concepts of Automation[L1]
CO2	Understand the fundamentals of Usecases. [L2]
CO3	Analyze thesoftware testing modelsL4]
CO4	Apply the no code ideas in the testing[L3]
CO5	Apply the concepts in real time entities and case studies in automation [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**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**
CO3	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**3**
CO4	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**3**
CO5	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**3**	**3**	**2**
CO2	**1**	**3**	**3**	**2**
CO3	**2**	**3**	**3**	**2**
CO4	**2**	**2**	**2**	**1**
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
EBCS22E21	FOUNDATION OF ROBOTICS AUTOMATION	Ty	3	0/0	0/0	3

UNIT I **9Hrs**

Overview- Types of automation -Overview of IT automation -Automation use cases -Automation trends -AI and machine learning in automation

UNIT II **9Hrs**

Role of Automation in Computer-based Systems- Machine Readable Specification&Design- Automatic Code Verification-Automatic Load Testing- Automatic Problem Discovery- Intelligent Operator Training

UNIT III **9Hrs**

Machine learning and workflow- Hyperautomation- Intelligent automation- Intelligent industrial robots- Low-code or no-code workflow

UNIT IV **9Hrs**

Terminologies used in Testing- How to write testcases- Principles of testing- Test process steps- Levels of independence in testing- Levels of testing- Software testing models- Introduction to Jira tool-Bugzilla Tool

UNIT V **9Hrs**

Invoicing without the use of paper- Applications for jobs - Automated notifications and warnings- Documents in the cloud- Automated software testing- Online sales and marketing- New career paths- Enhancing the need of cybersecurity- Automated data imports and exports

Total Hours:45

TEXT BOOKS:

1. Suresh Chandra Satapathy, Ajay Kumar Jena, Jagannath Singh, Saurabh Bilgaiyan," Automated Software Engineering: A Deep Learning-Based Approach (Learning and Analytics in Intelligent Systems) 1st ed. 2020 Edition"
2. Design, Build, Ship: Faster, Safer Software Delivery 1st Edition, by Sam Newman (Author), ISBN-13: 978-1491984871

REFERENCE BOOKS:

1.Raoul-Gabriel Urma, Richard Warburton, " Real-World Software Development: A Project-Driven Guide to Fundamentals" 1st Edition

COURSE CODE	COURSE NAME:	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBCS22E22	**SOCIAL COMPUTING**					
	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

- Understand the concepts and various types of design patterns in social computing techniques
- Analyze the techniques and applications of social computing**.**
- Design various applications to solve the social computing models

COURSE OUTCOMES (COs): Students will be able to

CO1	Remember the basic concept of data Collection and Tools[L1]
CO2	Apply, evaluate the Data Process Methodology in social computing approaches[L3]
CO3	Recognize the feasibility of applying a social computing methodology for a particular Learning model. [L3]
CO4	Design the methodology to solve optimization problems using Artificial algorithms[L6]
CO5	Design social network analysis to revise the principles of social computing in various applications[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	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
EBCS22E22	SOCIAL COMPUTING	Ty	3	0/0	0/0	3

UNIT I DATA COLLECTION **9Hrs**

Data Collection-Data types and sources, Data Collection and Tools- Data Acquisition, Common Data Processing Toolkit.

UNIT II DATA PROCESSING METHODOLGY **9Hrs**

Data Processing Principles-Behavior Tracking, Data Processing Methods.

UNIT III-SUPERVISED AND UNSUPERVISED LEARNING MODELS **9Hrs**

Supervised Learning Models-Generalized Linear Algorithms, Decision Trees, Bayesian Method, Bayesian Regression, Gaussian Processes. Unsupervised learning model-Dimensionality Reduction Algorithm, Clustering algorithm.

UNIT IV-STATE-OF-THE-ART ARTIFICAL INTELLIGENCE ALGORITHMS **9Hrs**

Deep Learning, Reinforcement Learning, Brother Learning, Epiphany Learning.

UNIT V-SOCIAL NETWORK DATA MINING AND KNOWLEDGE DISCOVERY **9Hrs**

Online Social Networks Text Processing Method-Information Extraction, Keyword Mining, Topics Detection and Tracking, online Social Networks Image Recognition methods-Image Retrieval, Image object Detection and Classification.

Total Hours: 45

TEXT BOOKS:

1. “Social Computing with Artificial Intelligence” ,byXung Liang, Springer 2020.

REFERENCE BOOKS:

1.Huan Liu John J. Salerno Michael J.young,” Social Computing, Behavioral Modeling and Prediction”, Springer, 2008.

2.Ajith Abraham,” Computational social Network Analysis”: Springer

COURSE CODE: EBCS22E23	COURSE NAME: ENTERPRISE ARCHITECTURE	Ty/Lb/ ETL/IE	L	T/S. Lr	P/R	C
	Prerequisite: Nil	Ty	3	0/0	0/0	3

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

OBJECTIVE:

The students should be made to

- To understand, manage and develop business strategy in a complex IT landscape.
- To create a map or blueprint of the structure and operations of an organization.
- To handling the relationship and interdependencies of these elements and aligning them.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the basic concepts of Enterprise Architecture.
CO2	Analyze various EA Framework
CO3	Apply the knowledge to Evaluate the EA Framework Implementation.
CO4	Analyze the EA Framework with Broad view in process management.
CO5	Understand the Overall evaluation and perspectives.

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

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

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
EBCS22E23	ENTERPRISE ARCHITECTURE	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION 9 Hrs

An overview of Digital Transformation and Enterprise Architecture, The purpose and Scope of this Research, The Primary Related Research.

UNIT II DIRECTION OF DIGITAL IT AND ENTERPRISE ARCHITECTURE 9 Hrs

Introduction, Directions of Cloud/Mobile IT, EA Frameworks-TOGAF, FEAF, Adaptive EA, EA Framework Analysis, Agile Enterprise Architecture and Scaling Agile Frameworks.

UNIT III EVALUATION FOR EA FRAMEWORK IMPLEMENTATION METHOD 9 Hrs

Case of EA Framework Building in a Global Pharmaceutical Company, Evaluation and Analysis of Case Study.

UNIT IV EVALUATION OF ARCHITECTURE BOARD REVIEW PROCESS WITH KNOWLEDGE MANAGEMENT 9 Hrs

Case of "Architecture Board Reviwe" in Global HealthCare Company, Evaluation and Analysis of Case Study of Architecture Board view, Global Communication Case Study, Verification and summary.

UNIT V OVERALL EVALUATION AND PERSPECTIVES 9 Hrs

Overall Evaluation-valuation of AIDAF for agility-Related Elements, Perspectives on AIDAF-Benefits of EA Implementation-AIDAF, Challenges Encountered in EA Implementation of AIDAF, Global Communication Structure in Architecture Board.

Total Hours: 45

TEXT BOOK:

1. Yoshimasa Masuda MurlikrishnaViswanthan, 2019, Enterprise Architecture for Global Companies in a Digital IT Era, Springer.

REFERENCE BOOKS:

1. Thierry PerroudRetoInversini , 2013 "Enterprise Architecture Patterns", Springer.
2. Danny Greefhorst Erik Proper , 2011 "Architecture principles of Enterprise Architecture" Springer

CourseCode: **EBCS22E24**	Course Name : **NETWORK FORENSICS**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Computer Networks	**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

- Provide a comprehensive understanding of network forensic analysis principles
- Understand the relationship between network forensic analysis and network security technologies.

COURSE OUTCOMES (COs) : Students will be able to	
CO1	Learn to identify network security incidents and potential sources of digital evidence.
CO2	Demonstrate the ability to perform basic network data acquisition and analysis using computer based applications and utilities
CO3	Identify potential applications for the integration of network forensic technologies
CO4	Apply tools for network forensic investigation
CO5	Recognize the network details and routing path

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

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**1**	**3**	**3**
CO2	**3**	**2**	**3**	**3**
CO3	**3**	**2**	**3**	**3**
CO4	**3**	**2**	**3**	**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	L	T/ S.Lr	P/R	C
EBCS22E24	NETWORK FORENSICS	Ty	3	0/0	0/0	3

UNIT I Technical Fundamentals **9 Hrs**

Concepts in digital evidence- challenges- investigative methodology- sources of network based evidence- principles of internetworking-Internet Protocol suite- Evidence acquisition

UNIT II Packet and Statistical Flow Analysis **9 Hrs**

Packet analysis - protocol analysis - flow analysis- higher layer traffic analysis – Statistical Flow analysis:- sensors-flow record export protocols- collection and aggregation- analysis tools and techniques – Case study and Tools Analysis: Wire Shark

UNIT III Network Intrusion Detection and Analysis **9 Hrs**

NIDS/NIPS functionality- modes of detection-types-NIDS/NIPS evidence acquisition -NIPS/NIDS interfaces – packet logging – Case study and Tools Analysis : Snort

UNIT IV Network Devices and Servers **9 Hrs**

Sources of Logs-Network log architecture- collecting and analyzing evidence- Switches- routers – firewalls- interfaces-logging - Case study and Tools Analysis: Angry IP Scanner

UNIT V Network Tunnelling and Case Studies **9 Hrs**

Tunneling for functionality, confidentiality- covert tunneling- trends in malware evolution-network behavior of malware – future of malware and network forensics - Case study and Tools Analysis : Cuckoo Sandbox

Total Hours: 45

TEXT BOOK:

1. Network Forensics : Tracking Hackers Through CyberSpace Sherri Davidoff,Jonathan Ham Pearson Education 2012

REFERENCE BOOKS:

1. Introduction to Security and Network ForensicsWilliam J. Buchanan Auerbach Publications 2012
2. Handbook of Digital Forensics and Investigations, 1st Edition Eoghan Casey ed., Elsevier Academic Press, ISBN 13: 978-0-12-374267-4,.

COURSE CODE: **EBCS22E25**	COURSE NAME: **DISTRIBUTED COMPUTING**	**Ty/Lb/ ETL/IE**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: Operating Systems	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

OBJECTIVE:

The students should be made to

- understand the design of distributed systems
- understand communication concepts of distributed systems
- apply the memory management design of distributed systems to design a new memory

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand and analyze the relation among model designs of distributed computing systems [L2]
CO2	Apply the inter-process communication concepts of distributed systems[L3]
CO3	Understand a new memory with effective synchronization[L2]
CO4	Apply appropriate scheduling between resource and process[L3]
CO5	Analyze the security, consistency and replication of the distributed file system [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**	**2**	**2**	**2**	**1**	**1**	**1**				**1**	**1**
CO2	**2**	**3**	**2**	**2**	**1**	**1**	**2**				**1**	**1**
CO3	**3**	**3**	**3**	**2**	**1**	**1**	**2**				**1**	**1**
CO4	**3**	**3**	**3**	**2**	**2**	**2**	**1**				**2**	**2**
CO5	**3**	**3**	**3**	**2**	**2**	**1**	**2**				**1**	**1**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**3**	**3**	**2**
CO2	**2**	**3**	**2**	**2**
CO3	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**2**	**3**
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
EBCS22E25	DISTRIBUTED COMPUTING	Ty	3	0/0	0/0	3

UNIT I Fundamentals and Remote Procedure Call 9 Hrs

Introduction to distributed computing system, Different models, Message passing-Introduction, Desirable features of a good message passing system, Issues in IPC, Synchronization, Buffering, Multidatagram, Process addressing, Failure handling, Group communication - Introduction, RPC model, transparency of RPC, Implementing RPC mechanism, Stub generation, RPC messages, Marshalling arguments and results, Sever management, parameter-passing semantics, Call semantics, Communication protocols for RPCs-Lightweight RPC.

UNIT II Distributed Shared Memory and Synchronization 9 Hrs

Introduction, General architecture of DSM systems, Design and implementation issues of DSM,Granularity, Structure of shared memory space, Consistency model, Replacement strategy, Thrashing, Different approaches to DSM, Advantages of DSM, Clock synchronization, Event ordering, Mutual exclusion, Deadlock, Election algorithm.

UNIT III Resource and Process Management 9 Hrs

Introduction, Desirable features of a good global scheduling algorithm, Task assignment approach, Load balancing approach, Load sharing approach, Process migration, Threads.

UNIT IV DFS/DCE Security 9 Hrs

Desirable features of good DFS, File models, File accessing, models, File sharing semantics, File cachingschemes, File replication, Fault tolerance, Atomic Transaction, Design principles, Authentication, Access control, Digital signatures, DCE security service.

UNIT V CONSISTENCY AND REPLICATION 9 Hrs

Introduction - Data-Centric Consistency Models- Client-Centric Consistency Models- Replica Management - Consistency Protocols

Total Hours: 45

TEXT BOOK:

1. Pradeep K. Sinha (2012 Reprint) ,Distributed Operating System Concepts and Design PHI
2. Ajay D. Kshemkalyani ,MukeshSinghal (2008), Distributed computing : principles, algorithms and systems – Cambridge University Press

REFERENCE BOOKS:

1. Andrew S. Tenenbaum (2012), Modern Operating System (3rd ed.) PHI
2. Andrew S. Tenenbaum&MaatrenVansteen (2012) Distributed systems: Principles & Paradigms (2nd ed.),PHI
3. HagitAttiya And Jennifer Welch (2004) Distributed computing fundamentals, simulations and Advanced Topics (Digitized in 2007) (2nd ed.), Wiley
4. Jean Dollimore, Tim Kindberg, And George Coulouris (2005) Distributed Systems: Concepts and Design (4th ed.) Pearson Education

PROGRAM ELECTIVE -IV

COURSE CODE: EBDA22E01	COURSE NAME : BUSINESS ANALYTICS FOR DATA SCIENCE	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/IE : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE :
The students should be made to

- Understand and apply the basic concepts in Business Data Analytics such .

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the concepts of Business Data analytics.
CO2	Understand data preparatory and preprocessing steps.
CO3	Use basic data analytical tools.
CO4	Understand the concept of Time series analysis.
CO5	Apply the statistical 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	3	2	3	2	1	-	-	-	-	-	1
CO2	2	2	2	2	3	1	-	-	-	-	1	2
CO3	3	3	3	2	3	1	1	-	-	-	1	2
CO4	3	2	3	2	3	2	1	-	-	-	1	1
CO5	3	2	2	3	3	2	1	-	-	-	1	1

COs /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1
CO2	3	2	1	2
CO3	2	2	2	1
CO4	2	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 CODE:	Course Title	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBDA22E01	**BUSINESS ANALYTICS FOR DATA SCIENCE**	Ty	3	0/0	0/0	3

UNIT I Introduction to Business Analytics **9Hrs**

Business Data Analytics – Types of Business Problems – Role of information in Business Decision Making – Uncertainty Risk – Data Information Nexus – Analytics Requirements – Data Sources – Data Organization and structures

UNIT II Data Handling **9Hrs**

Data Frames – Merging or Joining – Reshaping– Sorting – Querying – Data Visualization –Issues complicating Data visualization – Visualizing Spatial Data –Visualizing Time Series Data–Pre-processing Methods–Transformation – Encoding – Dimension –Handling missing Data.

UNIT III Intermediate Analytics **9Hrs**

OLS Regression –Analysis of Variance –ANOVA for basic Regression–ANOVA for Multiple Regression –Predictive analysis–Predicting Vs Forecasting –Developing a prediction–Simulation tools.

UNIT IV Time Series Analysis **9Hrs**

Basic concepts –Data cube and Time seriesdata–Handling date and time using python –Time series generation process AR(1) Model–Visualization for AR(1)Detection

UNIT V Statistical Table **9Hrs**

Data Preprocessing–Categorical Data– Frequency Table- Hypothesis Testing– Extending the cross tab–Pivot Table.

Total Hours: 45

Text Books:

1.Walter R.Paczkowski, “Business Analytics - Data Science for Business Problem”, Springer, 2021

Reference Books:

1.Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.

2.Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, “Fundamentals of Data Science”, CRC Press, 2022.

COURSE CODE: EBDA22E02	COURSE NAME : DESCRIPTIVE ANALYSIS	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Data Science and Statistics	Ty	3	0/0	0/0	3

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

OBJECTIVE :
The students should be made to

- To understand the basics of Data Explorations and basic concepts of Data visualization.
- To study the linear and non-linear ways of Data visualization
- To explore the Data visualization using R language
- To apply various Data visualization techniques for a variety of tasks

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the basics of Descriptive Analytics &Data Exploration[L2]
CO2	Understand various Data Visualization methods[L2]
CO3	Apply the concept of Data Visualization on various datasets[L3]
CO4	Apply the data visualization techniques using R language[l3]
CO5	Apply use case experience to solve real world business problems and model with analytical solutions.[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	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 CODE:	Course Title	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBDA22E02	DESCRIPTIVE ANALYSIS	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO DESCRIPTIVE ANALYSIS **9Hrs**

Types of Data analytics - Descriptive, Diagnostic, Predictive, Prescriptive. - Descriptive Statistics Overview – Purpose of Descriptive analytics - Descriptive Statistics vs. Inferential Statistics - Data Types (nominal, ordinal, interval, and ratio) – Data Collection& Data preparation – Data set.

Unit II DESCRIPTIVE ANALYSIS TECHNIQUES **9Hrs**

Measures of central tendency (mean, median, mode) - Measures of Dispersion: Range, IQR, Variance, Standard Deviation - Data Aggregation - Data Mining (Data Discovery) - Skewness and kurtosis - Quantitative Descriptive Statistical Analysis

Unit III EXPLORATORY DATA ANALYSIS **9Hrs**

Introduction to Data Exploration, Exploratory data analysis -Data transformation techniques- Introduction to R and RStudio - The Basics of Data Exploration - Loading Data into R -Transforming Data - Creating Clean Data – Applying descriptiveanalysis techniques to sample datasets

Unit IV MODELLING **9Hrs**

Descriptive Modelling- Data Preparation Issues with Descriptive Modelling- Principal Component Analysis- Clustering Algorithms- Interpreting Descriptive Models- Standard Cluster Model -Interpretation

Unit V DATA PRESENTATION & INTERPRETATION **9Hrs**

Data Visualization Overview – Stages of Visualization, Processing & Data Mapping, Connections & Correlations -Tables and Graphs, Infographics,DataStorytelling,Data Visualization using ggvis, ggplot2 packages in R R- Line Graphs, R- Bar Charts, Box plots, Histogram, Heatmap, Network Diagrams, Correlation matrices, Stream graph.Hypothesis& Problem-solving using R statistical testing features.Case Studies and Real-World Applications.

Total Hours: 45

Text Books:

1."Statistics" by Robert S. Witte and John S. Witte
2.Practical Statistics for Data Scientists" by Andrew Bruce and Peter Bruce

Reference Books:

1.Introduction to the Practice of Statistics" by David S. Moore, George P. McCabe, and Bruce A. Craig
2..Principles of Statistics" by M.G. Bulmer
3.Statistics for Business and Economics" by Paul Newbold, William L. Carlson, and Betty Thorne.

COURSE CODE: EBDA22E03	COURSE NAME : DECISION SUPPORT SYSTEMS	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Management Information System	Ty	3	0/0	0/0	3

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

OBJECTIVE :

The students should be made to

- To understand the basics of Management Support Systems.
- To study the concepts of Decision Support Systems .
- To explore the structure and working of Expert Systems.
- To study the fundamentals of Advanced Intelligent Systems.

COURSE OUTCOMES (COs): Students will be able to	
CO1	Understand the basics of Management Support Systems.
CO2	Understand concepts of Decision Support Systems and it components.
CO3	Analyze the different mathematical models and problems solving methods.
CO4	Analyze the DSS development methodologies and tools.
CO5	Understand the basics of Enterprise Decision Support systems and Knowledge management.

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	3	2	2		2	1	1	1
CO2	3	3	2	3	3	1	1		2	2	2	1
CO3	3	2	3	3	3	3	1	1	1	2	1	1
CO4	3	2	3	3	3	2	2	1	2	1	1	2
CO5	2	3	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 CODE:	Course Title	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBDA22E03	**DECISION SUPPORT SYSTEMS**	Ty	3	0/0	0/0	3

Unit I MANAGEMENT SUPPORT SYSTEMS: AN OVERVIEW 9Hrs

Managerial Decision-making and Information Systems - Computerized Decision Support and the Supporting Technologies - A Framework for Decision Support - The Concept of Decision Support Systems - Group Support Systems - Enterprise Information Systems - Knowledge Management Systems-Expert Systems - Artificial Neural Networks- Advanced Intelligent Decision Support Systems-Hybrid Support Systems-Decision Making Systems- Phases of Decision Making Process.

Unit II DECISION SUPPORT SYSTEMS: AN OVERVIEW 9Hrs

Decision Support Systems- Characteristics and Capabilities of DSS- Components of DSS–Data Management Subsystems–Model Management Subsystems–User Interface (Dialog) Subsystem– Knowledge-Based Management Subsystem – DSS Hardware – DSS Classifications.

Unit III MODELING AND ANALYSIS 9Hrs

MSS Modeling-Static and Dynamic Models-Certainity, Uncertainity, and Risk, Influence Diagrams, The structure of MSS Mathematical Models, Mathematical Programming Optimization, Multiple Goals, Senstivity Analysis, What-If, and Goal Seeking, Problem –Solving Search Methods, Heuristic Programming – Simulation-Visual Interactive Modeling and Visual Interactive Simulation

Unit IV DECISION SUPPORT SYSTEM DEVELOPMENT 9Hrs

Data Collection ,Problems, and Quality, Database Management Systems in DSS-Data Warehousing-Data mining-Introduction to DSS Development – Traditional System Development Life Cycle – Alternative Development Methodologies–DSS development Methodology–Change Management– DSS Technology Levels and Tools– DSS Development Platforms - DSS Development Tool Selection-Team-Developed DSS-EndUserDevelopedDSS.

Unit V ENTERPRISE DECISION SUPPORT SYSTEMS AND KNOWLEDGE MANAGEMENT 9Hrs

Group Support Systems- Enterprise Information Systems: Concepts and Definitions-Comparing and Integrating EIS and DSS-EIS-Knowledge Management- Organizational Learning and Transformation – Information Technology in Knowledge Management -Knowledge Management Systems Implementation-Roles of People in Knowledge Management-Ensuring success of Knowledge Management.

Total Hours: 45

Text Books:

1."Decision Support Systems and Intelligent Systems" (Seventh Edition) by Efraim Turban, Jay E.Aronson, Ting- Peng Liang. Prentice-Hall, Inc, Reprint 2020

Reference:

1.Decision Support And Business Intelligence Systems (9th Edition) by EfraimTurban,RameshSharda,Dursun Delen, Publisher: Pearson, Reprint 2018.

2.Decision Support Systems(6th Edition) by V. S. JanakiRaman, K. Sarukesi, Prentice Hall Publication,2008

COURSE CODE: EBDA22E04	COURSE NAME : KNOWLEDGE ENGINEERING AND MANAGEMENT	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Principles of Management and Behavioral Science	Ty	3	0/0	0/0	3

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

OBJECTIVE :
The students should be made to

- To understand the basics of Knowledge Engineering.
- To discuss methodologies and modeling for Agent Design and Development.
- To design and develop ontologies.
- Learn the Evolution of Knowledge management.
- Be familiar with tools.

COURSE OUTCOMES (COs): Students will be able to

CO1	Understand the basics of Knowledge Engineering.
CO2	Apply methodologies and modelling for Agent Design and Development.
CO3	Design and develop ontologies.
CO4	Apply the Management Tools
CO5	Design and develop Enterprise Application.

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	1	-	-	1	2	1	2
CO2	3	2	3	2	2	-	-	-	2	1	2	1
CO3	2	2	3	2	2	-	-	-	2	2	2	2
CO4	2	2	3	1	1	-	-	-	2	1	2	2
CO5	2	2	2	1	1	-	-	-	1	2	1	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	Practical /Project			
					✔							

COURSE CODE	Course Title	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBDA22E04	KNOWLEDGE ENGINEERING AND MANAGEMENT	Ty	3	0/0	0/0	3

UNITI REASONINGUNDERUNCERTAINTY 9Hrs

Introduction–Abductive reasoning–Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability– FuzzyProbability–Uncertaintymethods-Evidence-basedreasoning–IntelligentAgent–Mixed-InitiativeReasoning–KnowledgeEngineering.

UNITII METHODOLOGYAND MODELING 9Hrs

Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment –Drill-DownAnalysis,Assumption-basedReasoning,andWhat-IfScenarios.

UNITIII ONTOLOGIES–DESIGNAND DEVELOPMENT 9Hrs

Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features –Representation–Transitivity–Inheritance –Concepts as FeatureValues–OntologyMatching.DesignandDevelopmentMethodologies–StepsinOntologyDevelopment–DomainUnderstandingandConceptElicitation–Modelling-basedOntologySpecification.

UNITIV INTRODUCTIONABOUTKNOWLEDGE 9Hrs

Introduction: An Introduction to Knowledge Management - The foundations of knowledge management- including cultural issues- technology applications organizational concepts and processes-management aspects- and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management - Key Challenges Facing the Evolution of Knowledge Management - Ethics for Knowledge Management. Information.

UNITV KNOWLEDGE MANAGEMENT-THE TOOLS & CASE STUDIES 9Hrs

Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval .Case Studies (From Library to Knowledge Center, Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).

Total Hours: 45

Text Books:

1.Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, "Knowledge EngineeringBuilding Cognitive Assistants for Evidence-based Reasoning", Cambridge University Press,FirstEdition,2016.
2.ElaKumar, Knowledge Engineering ,IK International Publisher House,2018.

Reference:

1.RonaldJ. Brachman, HectorJ. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann,2004.
2.Nonaka, I., Takeuchi, H., "The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation", Oxford University Press, 1995.

COURSECODE: EBDA22E05	COURSENAME: SOCIAL MEDIA ANALYTICS	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: Social Media	Ty	3	0/0	0/0	3

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

OBJECTIVES:

Students will be

- Acquire a foundational understanding of Social Analytics, key concepts, methodologies, and their applications.
- Able to measure and analyze diverse user activities on social platforms, utilizing techniques.
- Interpret the types and properties of social networks and applying metrics like degrees and connection counting.
- Gain the ability to apply traditional models, forecasting metrics, and identifying periodicities in user activities.
- Proficient in evaluating the popularity of topics, identifying term occurrences in text, and assessing individual users' interests.

COURSEOUTCOMES (COs): Students will be able to

CO1	Proficiently apply advanced analytics to derive insights from social data, and User Behavior in Social.
CO2	Excel in network analysis, distinguishing explicit and implicit social networks, and utilizing visualization tools and metrics.
CO3	Demonstrate the ability to analyze temporal patterns and forecast trends in user behavior.
CO4	Showcase expertise in content analysis through NLP, identifying term occurrences, topic modeling, and evaluating individual users' interests' diversity.
CO5	Navigate large dataset processing using MapReduce, addressing challenges related to long-tailed social media data, demonstrating practical 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	3	2	2	2				2	3	3	3
CO2	2	3	2	1	3				3	3	3	2
CO3	2	3	2	1	2				2	3	2	2
CO4	1	2	2	3	2				3	3	2	2
CO5	2	2	2	1	3				2	3	2	1

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

3/2/1indicates strengthofcorrelation3 – High,2 –Medium,1 – Low

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

COURSECODE: EBDA22E05	COURSENAME: SOCIAL MEDIA ANALYTICS	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
	Prerequisite: Social Media	Ty	3	0/0	0/0	3

Unit 1 UNDERSTANDING USER BEHAVIOR IN SOCIAL MEDIA 9Hrs

Introduction to Social Media Analytics, Measuring User Behavior in Wikipedia, Diversity of User Activities, Power Law and Long Tail in Human Activities, Online Behavior on Twitter: Retrieving Tweets for Users-Logarithmic Binning-User Activities on Twitter.

Unit 2 EXPLORING SOCIAL NETWORKS IN SOCIAL MEDIA 9Hrs

Types and Properties of Social Networks, Explicit and Implicit Networks, Visualizing Networks, Degrees and Connection Counting, Correlations: Triangles, Clustering, and Assortativity, Social Media Services Online : Search Engines, Content Engagement, Interactions with the Real World, Interactions with People

Unit 3 Temporal Analysis in Social Media 9Hrs

Traditional Models for Events in Time, Inter-Event Times and Autocorrelations, Periodicities in User Activities, Bursty Activities and Reservoir Sampling, Forecasting Metrics and Time Series Analysis, ARIMA Model. Learn Map: Learning and Mapping, Matrix Factorization, Learning, Training, Regularizing in Matrix Factorization, Non-Negative Matrix Factorization and Sparsity.

Unit 4 Analyzing Content in Social Media 9Hrs

Defining Content and Natural Language Processing, Term Occurrences in Text and Topic Identification, Popularity of Topics, Individual Users' Interests Diversity, Topic Modeling Techniques. Prediction and Recommendation: Evaluation, Overview of Methodologies.

Unit 5 Processing and Learning from Large Datasets 9Hrs

Introduction to MapReduce, Counting Words and Multi-Stage Flows, Joining Data Sources and MapReduce Patterns, Large-Scale MapReduce Models, Challenges with Long-Tailed Social Media Data, Sampling and Approximations Techniques, HyperLogLog, Bloom Filters, Count-Min Sketch, Executing on a Hadoop Cluster

Total Hours: 45

TEXTBOOKS:

1.Social Media Data Mining and Analytics, Szabo, G., G. Polatkan, O. Boykin & A. Chalkiopoulus, John Wiley & Sons, Inc. 2nd edition, 2021.

REFERENCEBOOKS:

1.Seven Layers of Social Media Analytics Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data, Gohar F. Khan, 2020.

2.Social Media Analytics :Techniques and Insights for Extracting Business Value Out of Social Media, Matthew Ganis, Avinash Kohirkar, IBM Press, 2019.

SubjectCode: EBDA22E06	Subject Name: **BAYESIAN DATA ANALYSIS**	**Ty/Lb/ ETL**	**L**	**T/S .Lr**	**P/R**	**C**
	Prerequisite: basics of Probability theory	**Ty**	**3**	**0/0**	**0/0**	**3**

L:LectureT:Tutorial S.Lr:Supervised LearningP: ProjectR: ResearchC: Credits
T/L/ETL:Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- Basic principles of applied Bayesian analyses.
- Introduction to JAGS/Stan programming.
- Generalized linear models with applications to real data
- Mixed effects models.

COURSEOUTCOMES(COs) :(3- 5)

CO1	Ability to understand Bayesian inference basic knowledge with single and Multi-parmeters models.
CO2	Discuss the fundamentals of Bayesian techniques with Hierarchical models.
CO3	Learn the JAGS and Stans programming for various Bayesian computation models.
CO4	Analyze various types of Regression Models
CO5	Analyze various parametric Nonlinear and Nonparametric Models 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**	**3**	**2**	**3**	**2**	**3**			**2**	**3**	**2**	**3**
CO2	**3**	**3**	**2**	**3**	**3**	**3**			**2**	**2**	**3**	**3**
CO3	**2**	**2**	**2**	**3**	**3**	**3**			**2**	**2**	**2**	**3**
CO4	**3**	**3**	**2**	**3**	**3**	**3**			**2**	**2**	**2**	**3**
CO5	**3**	**3**	**2**	**3**	**3**	**3**			**2**	**2**	**2**	**3**

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

3/2/1IndicatesStrengthOfCorrelation,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			
					✓							

SUBJECTCODE	SUBJECT NAME	Ty/Lb/ETL	L	T/S.Lr	P/R	C
EBDA22E06	BAYESIAN DATA ANALYSIS	Ty	3	0/0	0/0	3

UNITI FUNDAMENTALS OF BAYESIAN INFERENCE 9Hrs

Introduction–Probability and inference– steps–statistical inference–Bayesian inferenceand model parameters–Bayes's rule- Standard distributions—binomial, normal, Poisson, and exponential –prior and posterior distributions – informative, Non-informativeprior distributions - single and multi-parameter models.

UNITII FUNDAMENTALS OF BAYESIAN DATA ANALYSIS 9Hrs

InformedsearchStrategies–Hierarchical models–Model checking-Posterior predictive checking-Evaluating, comparing, and expanding models-Modeling accounting-Decision analysis-Multistage decision making.

UNITIII ADVANCED COMPUTATION 9Hrs

Introduction to Bayesian computation-Direct simulation-Deterministic methods- Markov chain simulation-Gibbs sampler-Metropolis-Hastings algorithms-Markov chain Monte Carlo– JAGS programming language for implementing MCMC-Stan programming

UNITIV REGRESSION MODELS 9Hrs

Introduction-Conditional modeling- classical regression -Goals of regression analysis-Hierarchical linear models- Unequal variances and correlations-Varying intercepts and slopes -batching and transformation - Generalized linear models-Standard models.

UNITV NONLINEAR AND NONPARAMETRIC MODELS 9Hrs

Parametric nonlinear models- Basis function models Gaussian process models–Finite mixture models–Dirichlet process models.

TotalHours:45

TEXTBOOKS:

1. Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis. CRC press.Third edition.
2. Hoff, P. D. (2009). A first course in Bayesian statistical methods (Vol. 580). New York: Springer.

REFERENCE BOOKS:

1. Johnson, A. A., Ott, M. Q., &Dogucu, M. (2022). Bayes rules!: An introduction to applied Bayesian modeling. CRC Press.
2. Kruschke, J. K. (2010). Bayesian data analysis. Wiley Interdisciplinary Reviews: Cognitive Science, 1(5), 658-676.

COURSE CODE: EBAI22E22	COURSE NAME : PROMPT 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/IE : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE :

The students should be made to

- Have the fundamental understanding of the basic concepts of prompt engineering
- Understand and the role of prompt engineers in Generative AI-powered systems and Natural Language Processing
- Develop a deep knowledge of Large Language Models (LLMs) and their workings

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the fundamentals of prompt engineering and generative AI [L2]
CO2	Apply different prompt patterns for designing prompts[L3]
CO3	Apply and analyze different Practices for Text Generation [L4]
CO4	Apply and analyze different Practices for Image Generation[L4]
CO5	Develop and optimize prompts to efficiently use language models (LMs) for a wide variety of 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	2	2	2	2	2	1		2	1			1
CO2	2	2	2	2	2	1		2	1			1
CO3	3	3	3	3	3	2		2	2			2
CO4	3	3	3	3	3	2		2	2			2
CO5	3	3	3	3	3	2		2	2			2

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

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

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

COURSE CODE	COURSE NAME	Ty/Lb/ETL/IE	L	T/S.Lr	P/R	C
EBAI22E22	PROMPT ENGINEERING	Ty	3	0/0	0/0	3

UNIT I **9Hrs**

INTRODUCTION: Five Principles of Prompting-What is Prompt Engineering? -Give Direction -Specify Format -Provide Examples -Evaluate Quality -Divide Labor -Intro to Image Generation Models- What are Diffusion models? -OpenAI DALL-E-Midjourney -Stable Diffusion

UNIT II **9Hrs**

Standard Practices for Text Generation: Generating Lists -Hierarchical List Generation - Generating JSON- Filtering YAML Payloads -Handling Invalid Payloads in YAML - Context -Text Style Unbundling - Identifying the Desired Textual Features -Alternatively Extract Specific Relevant Textual Features -Generating New Content with the Extracted Features -Summarization -Chunking Text- Applying Prompt Engineering Principles -Sentence Detection using SpaCy -Sliding Window Chunking -Text chunking with Tiktoken - Encodings- API Calls for Token Usage -Sentiment -Least To Most -Role Prompting

UNIT III **9Hrs**

Standard Practices for Image Generation: Format Modifiers -Art Style Modifiers –Reverse Engineering Prompts -Quality Boosters -Negative Prompts -Weighted Terms -Inpainting-Outpainting -Meme Unbundling - Meme Mapping Vector Databases:What are Vector Databases? -What are Embeddings? -Document Loading - Memory Retrieval with FAISS -Hosted Vector Databases with Pinecone

UNIT IV **9Hrs**

Advanced Techniques for Text Generation:Meta Prompting -GPT Best Practices-LangChain - Langchain Prompt Templates -Output Parsers -Creating Few Shot Prompt Template- Data Connection- Text Splitters - Text Segmentation –Vector Stores- Retrievers- Task Decomposition -Prompt Chaining--Agents- Memory in LangChain- Advanced Agent Frameworks- Callbacks- Classification with LLMs -Building A Classification Model-Majority Vote For Classification

UNIT V **9Hrs**

Advanced Techniques for Image Generation: Stable Diffusion and AUTOMATIC1111- Img2Img - Upscaling Images -Interrogate CLIP-SD Inpainting and Outpainting -ControlNet -Segment Anything Model (SAM) -Textual Inversion -Dreambooth Fine-Tuning

Total Hours: 45

Text Book:

1.Prompt Engineering for Generative AI by James Phoenix, Mike Taylor, Released July 2024,Publisher(s): O'Reilly Media, Inc.ISBN: 9781098153373

Reference Book:

1.The Art of Prompt Engineering with ChatGPT: GPT-4, Plugins & DALL.E 3 Update - October 2023 (Learn AI Tools the Fun Way!) 23 Jan, 2023 by Nathan Hunter

https://github.com/dair-ai/Prompt-Engineering-Guide

PROGRAM ELECTIVE - V

COURSE CODE: EBDA22E07	PERVASIVE COMPUTING	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/IE : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE :

The objective of this course is
To learn the basics of pervasive computing and its applications
To understand various device technologies.
To study device connectivity and Web Application Concepts.
To analyze WAP and voice technologies in pervasive computing
To study PDA characteristics and web applications.

COURSE OUTCOMES (COs) :Students will be able to

CO1	Understand the history of pervasive computing and its applications [L2]
CO2	Implement the hardware, software and interfaces. [L3]
CO3	Design and develop WAP architecture, infrastructure and the security issues[L3]
CO4	Have an understanding the PDA device categories, characteristics, software, browsers and various mobile applications. [L2]
CO5	Apply user interface issues to solve real world business problems and model with analytical computing solutions[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	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	Engineering Science	Humanities and social Science	Program Core	Program elective	Open Elective	Inter Disciplinary	Skill Component	Practical /Project
					✓				

COURSE CODE:	PERVASIVE COMPUTING	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBDA22E07		Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO PERVASIVE COMPUTING 9Hrs

Pervasive computing: Past, present, future; the pervasive computing market, m-Business, challenges and future of pervasive computing - modeling key for pervasive computing -pervasive system environment interaction - architectural design for pervasive system, application examples of pervasive computing: Healthcare, Tracking, emergency information systems, home networking appliances and entertainment.

UNIT II DEVICE TECHNOLOGY FOR PERVASIVE COMPUTING 9Hrs

Hardware, computing devices and their characteristics-pervasive information access devices-smart identification, smart card, labels, tokens -embedded controls, smart sensors, actuators -Human-machine interfaces, Biometrics -Various Operating Systems for pervasive devices.

UNIT III COMMUNICATION TECHNOLOGIES FOR PERVASIVE COMPUTING 9Hrs

Connecting the world-WWAN, SRWC, DECT, Bluetooth, IrDA –mobile internet –internet protocols. Audio networks, data networks -wireless data networks -pervasive networks - service oriented networks -network design issues -Managing smart devices in virtual environments, human user-centered and physical environments -pervasive computing issues and outlook.

UNITIV WAP AND VOICE TECHNOLOGY 9Hrs

WAP and Beyond: Components of the WAP architecture - WAP infrastructure – WAP security issues - WML - WAP push - Products - i-Mode - Voice Technology: Basics of Speech recognition- Voice Standards - Speech applications - Speech and Pervasive Computing.

UNIT V PDA AND PERVASIVE WEB APPLICATION ARCHITECTURE 9Hrs

PDA: Device Categories - PDA operation Systems - Device Characteristics – Software Components - Standards - Mobile Applications - PDA Browsers Pervasive Web Application architecture: Background - Scalability and availability - Development of Pervasive Computing web applications - Pervasive application architecture.

Total Hours: 45

Text Books:

1.Minyi Guo, Jingyu Zhou, Feilong Tang- "Pervasive Computing: Concepts, Technologies and Applications (Paperback)", CRC Press, 2020

Reference Books:

1.Parikshit N. Mahalle, Prashant S. Dhotre “Context-Aware Pervasive Systems and Applications”,Springer Singapore, 2019.

2.Natalia Silvis Cividjian - "Pervasive Computing- Engineering Smart Systems", Springer Cham, 2017.

COURSE CODE: EBDA22E08	NATURE INSPIRED COMPUTING	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 develop computational models and advanced algorithms that are based on natural intelligence found in chemical, physical and biological systems.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understanding of Natural Inspirations in problem solving
CO2	Obtain knowledge about Genetic Algorithm
CO3	Acquire knowledge about Ant Colony Optimization
CO4	Gain knowledge about New Neural Materials
CO5	Attain knowledge about DNA Computing.

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	2	2	1	2	1	2	2
CO2	2	2	2	3	3	1	1		2	2	2	1
CO3	3	2	3	3	2	3	1		1	2	1	1
CO4	3	2	3	3	3	2	2		2	1	2	2
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 CODE	COURSE NAME	Ty/Lb/ ETL/IE	L	T/S.Lr	P/R	C
EBDA22E08	NATURE INSPIRED COMPUTING	Ty	3	0/0	0/0	3

UNIT 1 INTRODUCTION **9Hrs**

Aspiration From Nature -Working of Nature - Nature-Inspired Computing - Autonomous Entity-General Stochastic Process of Nature-Inspired Computation -NIC Categorization-Bioinspired Algorithm -Swarm Intelligence -Physical Algorithms -Familiar NIC Algorithms

UNIT 2 GENETIC ALGORITHMS **9Hrs**

Introduction of Genetic Algorithm - Background of GA - Natural Selection Theory Vs Search Heuristic Algorithm- Working Sequence of Genetic Algorithm –Population Initialization - Fitness Among the Individuals -Selection of Fitted Individuals -Crossover Point -Mutation -Application of Machine Learning in GA – Cellular Automata - Artificial Neural Networks – Simulated Annealing.

UNIT 3 OPTIMIZATION PROCESS **9Hrs**

Components of Optimization Algorithms- Optimization Techniques – Algorithms- Heuristic Algorithms and its classes- Metaheuristic Algorithms- Nature-Inspired vs. Non-Nature-Inspired - Ant Behaviour – Towards artificial Ants - Ant Colony Optimization – Problem solving using ACO- Data Processing Flow of ACO,

UNIT 4 COMPUTING WITH NEW NATURAL MATERIALS **9Hrs** DNA Computing: Motivation, DNA Molecule , Adelman’s experiment , Test tube programming language, Universal DNA Computers , PAM Model , Splicing Systems, Lipton's Solution to SAT Problem , Scope of DNA Computing , From Classical to DNA Computing.

UNIT 5 IMMUNO COMPUTING **9Hrs**

Introduction- Immune System, Physiology and main components, Pattern Recognition and Binding , Immune Network Theory- Danger Theory, Evaluation Interaction Immune Algorithms , Introduction – Genetic algorithms , Bone Marrow Models , Forest's Algorithm, Artificial Immune Networks.

Total Hours: 45

Text Book:

1.Balamurugan, S. Jain, Anupriya &Sharma,Nature-Inspired Algorithms and Applications, Wiley & Sons, Toronto, 2021

Reference Books:

1.Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies (Intelligent Robotics and Autonomous Agents)", MIT Press, Cambridge, MA, 2023.

COURSE CODE: EBDA22E09	FORMAL LANGUAGE AND FINITE AUTOMATA	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
	Prerequisite: **Nil**	Ty	3	/0	0/0	3

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

OBJECTIVE :

The objective of this course is

- To understand the concepts in Finite automata and Regular expressions.
- To identify different formal language classes and their relationships.
- To design grammars and recognizers for different formal languages.
- To prove or disprove theorems in automata theory using its properties.
- To determine the decidability and intractability of computational problems.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the basic properties of formal languages and grammars[L2]
CO2	Differentiate regular, context-free and recursively enumerable languages[L3]
CO3	Make grammars to produce strings from a specific language.[L2]
CO4	Acquire concepts relating to the theory of computation and computational modelsincluding decidability and intractability.[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	3	2	2	-	-	2	1	--	3
CO2	2	3	2	3	3	-	-	-	2	3	-	1
CO3	3	2	3	3	2	-	-	-	1	2	-	1
CO4	3	2	3	3	3	-	-	-	2	1	-	1
CO5	2	2	2	3	3	-	-	-	2	2	-	1

COs /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	1
CO2	3	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
EBDA22E09	FORMAL LANGUAGE AND FINITE AUTOMATA	Ty	3	0/0	0/0	3

UNIT 1 INTRODUCTION TO FINITE AUTOMATA 9Hrs

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory. **Nondeterministic Finite Automata:**Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.**Deterministic Finite Automata:**Definition, DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA, Moore and Melay machines

UNIT 2 REGULAR EXPRESSIONS 9Hrs

Regular Expressions: Finite Automata and Regular Expressions& Applications, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.**Pumping Lemma for Regular Languages,**Statement of the pumping lemma, Applications of the Pumping Lemma.**Closure Properties of Regular Languages:**Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

UNIT 3 CONTEXT-FREE GRAMMARS 9Hrs

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tress, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.**Push Down Automata:**the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

UNIT 4 NORMAL FORMS FOR CONTEXT- FREE GRAMMARS 9Hrs

Normal Forms for Context- Free Grammars: Eliminating useless symbols, Eliminating €-Productions. Chomsky Normal form Griebech Normal form.**Pumping Lemma for Context-Free Languages:**Statement of pumping lemma, Applications**Closure Properties of Context-Free Languages:**Closure properties of CFL's, Decision Properties of CFL's**TuringMachines:**Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

UNIT 5 TYPES OF TURING MACHINE 9Hrs

Types of Turing machine: Turing machines and halting **Undecidability** A Language that is Not Recursively Enumerable, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

Total Hours:45

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education, 2020

REFERENCE BOOKS:

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH, 2020
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley., 2017
3. Automata Theory and Formal Languages, Wladyslaw Homenda, Witold Pedrycz, De Gruyter · 2022
4. Automata and Computability, Anuradha A. Puntambekar, Repro Books Limited, 2020
5. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI, 2017

COURSE CODE: EBDA22E10	COURSE NAME : EXPLORATORY DATA ANALYSIS	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/IE : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE :

The students should be made to

- Understand the core principles and significance of Exploratory Data Analysis.
- Learn techniques for visualizing and transforming data to uncover patterns.
- Develop skills in advanced data visualization and interpretation for actionable insights.

COURSE OUTCOMES (COs) : Student will be able to

CO1	Explain the concept of data transformation and its importance in exploratory data analysis.
CO2	Choose appropriate techniques for various data sets and interpret the results effectively.
CO3	Identify clusters within data sets using clustering methods.
CO4	Acquire skills in data smoothing techniques for enhancing the interpretability of scatterplots.
CO5	Capable of creating advanced multivariate visualizations

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

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

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

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

COURSE	Course Title	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBDA22E10	EXPLORATORY DATA ANALYSIS	Ty	3	0/0	0/0	3

UNIT 1 INTRODUCTION **9Hrs**

Introduction, What is exploratory data analysis, overview of the text, A few words about notation, data set used in the book, transforming data. Dimensionality reduction-Linear Methods: Introduction, Principal component analysis-PCA, SVD, Factor analysis, intrinsic dimensionality.

UNIT II DIMENSIONALITY REDUCTION- NON LINEAR METHODS **9Hrs**

MDS, Manifold learning, ANN-Approach's. Data Tours: Grand tour, interpolation tours, Projection Pursuit, Projection Persuit indexes.

UNIT III FINDING CLUSTERS **9Hrs**

Introduction, Hierarchical method, Optimization method-k-means, Evaluating the clusters. Model based clustering: Overview of model based clustering, Finite mixtures, expectation- maximization algorithms, Hierarchical agglomerative model based clustering, model based clustering, generating random variables from a mixture model.

UNIT IV SMOOTHING SCATTERPLOTS **9Hrs**

Introduction, Loess, Robust loess, Residuals and diagnostics, bivariate distribution smooths, curve fitting toolbox. Visualizing Clusters: Dendrogram, Tree maps, Rectangle plots, ReClus Plots, Data Image.

UNIT V DISTRIBUTION SHAPES **9Hrs**

Histograms, Boxplots, Quantile plots, Bagplots. Multivariate Visualization: Glyph plots, scatterplots, Dynamic graphics, caplots, dot charts, Plotting points as curve, Data tours revisited.

Total Hours: 45

Text Book:

1. Exploratory Data Analysis with MATLAB by Wendy L. MartinezAngeland R. Martinez publisher A CRC Press Company

COURSE CODE: EBDS22E02	COURSE NAME : OPERATIONS RESEARCH	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/IE : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

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	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	2					1	1	1
CO2	2	3	2							1	2	1
CO3	3	2	3		3	2				1	1	1
CO4	3	2	3	2						1	2	1
CO5	2	2	2							1	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
EBDS22E02	OPERATIONS RESEARCH	Ty	3	0/0	0/0	3

UNIT 1 **9Hrs**

Introduction: Evolution of OR, Definitions of OR, Scope of OR, Applications of OR, Phases in OR study. Characteristics and limitations of OR, models used in OR, Linear Programming Problem (LPP), Generalized LPP- Formulation of problems as L.P.P. Solutions to LPP by graphical method (Two Variables).

UNIT 2 **9Hrs**

LPP: Simplex method, Canonical and Standard form of LP problem, slack, surplus and artificial variables, Solutions to LPP by Simplex method, Big-M Method. Concept of Duality, writing Dual of given LPP.Solutions to L.P.P by Dual Simplex Method.

UNIT 3 **9Hrs**

Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using North-West Corner rule, Vogel's Approximation method. Optimality in Transportation problem by Modified Distribution (MODI) method. Unbalanced T.P. Maximization T.P. Degeneracy in transportation problemsAssignment Problem- Formulation, Solutions to assignment problems by Hungarian method, Special cases in assignment problems, unbalanced, Maximization assignment problems. Travelling Salesman Problem (TSP).

UNIT 4 **9Hrs**

Network analysis: Introduction, Construction of networks, Fulkerson's rule for numbering the nodes, AON and AOA diagrams; Critical path method to find the expected completion time of a project, determination of floats in networks, PERT networks, determining the probability of completing a project, predicting the completion time of project; Cost analysis in networks. Crashing of networks- Problems.Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-deathmodels (only equations), Kendall & Lee's notation of Queuing, empirical queuing models –Numerical on M/M/1 and M/M/C Queuing models.

UNIT 5 **9Hrs**

Game Theory: Definition, Pure Strategy problems, Saddle point, Max-Min and Min-Max criteria, Principle of Dominance, Solution of games with Saddle point. Mixed Strategy problems. Solution of 2X2 games by Arithmetic method, Solution of 2Xn m and mX2 games by graphical method. Formulation of games.

Total Hours: 45

TEXT BOOKS:

1. Operations Research, P K Gupta and D S Hira, S. Chand and Company LTD. Publications, New Delhi – 2007
2. Operations Research, An Introduction, Seventh Edition, Hamdy A. Taha, PHI Private Limited, 2006.

REFERENCE BOOKS:

1. Operations Research, Theory and Applications, Sixth Edition, J K Sharma, Trinity Press, Laxmi Publications Pvt. Ltd. 2016.
2. Operations Research, Paneerselvan, PHI
3. Operations Research, A M Natarajan, P Balasubramani, Pearson Education, 2005
4. Introduction to Operations Research, Hillier and Lieberman, 8th Ed., McGraw Hill

Scheme of Examination: Two questions to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

COURSE CODE: EBDS22E08	COURSE NAME : SOCIAL NETWORK ANALYTICS	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/IE : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE :

The students should be made to

- •To understand the concept of semantic web and related applications.
- • To learn knowledge representation using ontology.
- • To understand human behaviour in social web and related communities.
- • To learn visualization of social networks.

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the basic concepts of social networks. (L2)
CO2	determine network measures.(L2)
CO3	Predict human behaviour in social web and related communities.(L3)
CO4	Predict and recommend in online social networks. (L3)
CO5	List different types of communities.(L1)

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	1	2	2	2		2	1	3	3
CO2	2	3	3	3	3	1	1		2	3	2	1
CO3	3	2	3	2	3	3	1		1	2	1	1
CO4	3	2	3	2	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
EBDS22E08	**SOCIAL NETWORK ANALYTICS**	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION **9Hrs**

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: - Analysis of Network Data - Interpretation of Network Data - Social Network Analysis in the Social and Behavioral Sciences - Metrics in social network analysis

UNIT IIWEB DATA AND SEMANTICS IN SOCIAL NETWORK ANALYSIS **9Hrs**

Web based Networks- Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNITIII SOCIAL NETWORKS INFRASTRUCTURES AND COMMUNITIES **9Hrs**

Community detection in social networks – Methods and Tools for communitydetection and mining - Applications of community mining algorithms –Decentralizedonline social networks - Multi-Relational characterization of dynamic social networkcommunities.

UNITIV PREDICTING HUMAN BEHAVIOUR AND ONLINE PRIVACY ISSUES **9Hrs**

Understanding and predicting human behaviour for social communities - User datamanagement - Inference and Distribution - Enabling new human experiences –Realitymining - Privacy in online social networks – Managing Trust in online social networks- Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT V Visualization and Applications of Social Networks **9Hrs**

Important metrics in social networking analysis - Graph theory - Centrality -Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online socialnetworks, Visualizing social networks with matrix-based representations –Covernetworks - Community welfare - Collaboration networks - Co-Citation networks.

Total Hours: 45

Text Books:

1. Peter Mika, ―Social Networks and the Semantic Web‖, First Edition, Springer 2007.
2. BorkoFurht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition, Springer, 2010.

Reference Books:

1. GuandongXu ,Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.

COURSE CODE: EBDS22E13	COURSE NAME : STREAM PROCESSING AND ANALYTICS	Ty/Lb/	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/IE : Theory/Lab/Embedded Theory and Lab/ Internal Evaluation

OBJECTIVE :
The students should be made to

- Study the design and architecture of modern distributed streaming systems as well as fundamental algorithms for analyzing data streams

COURSE OUTCOMES (COs) : Students will be able to

CO1	Understand the applicability and utility of different streaming algorithms [L2]
CO2	Apply the current research trends in data-stream processing[L3]
CO3	Analyze the suitability of stream mining algorithms for data stream systems [L4]
CO4	Analyze and build stream processing systems, services and applications [L4]
CO5	Effectively Solve problems in real-world applications that process data streams[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	2	3	2	1	2	-	-	3	2	-	3
CO2	3	2	2	2	3	3	2	1	3	2	2	3
CO3	3	3	2	3	3	3	3	3	3	2	2	3
CO4	3	2	3	3	3	2	2	2	3	3	3	2
CO5	3	3	3	3	3	2	2	2	2	3	2	3

COs /PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	1
CO2	3	2	2	2
CO3	2	2	2	2
CO4	3	3	3	3
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	Course Title	Ty/Lb/ ETL/IE	L	T / S.Lr	P/ R	C
EBDS22E13	STREAM PROCESSING AND ANALYTICS	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO DATA SYSTEMS **9Hrs**

Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges

UNIT II STREAMING ARCHITECTURES **9Hrs**

Components of a Data Platform- Architectural Models- The Use of a Batch-Processing Component in a Streaming Application- Referential Streaming Architectures- Streaming Versus Batch Algorithms. Apache Spark as a Stream-Processing Engine: Spark's Memory Usage- Understanding Latency- Throughput Oriented Processing- Fast Implementation of Data Analysis.

UNIT III DATA MODELS AND QUERY LANGUAGES **9Hrs**

Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many-to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL

UNIT IV STRUCTURED STREAMING **9Hrs**

Introducing Structured Streaming- The Structured Streaming Programming Model – Structured Streaming in Action – Structured Streaming Sources – Structured Streaming Sinks - Event Time– Based Stream Processing.

UNIT V REAL-TIME PROCESSING USING SPARK STREAMING **9Hrs**

Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication

Total Hours: 45

Text Books

1. Gerard Maas and François Garillot, , "Stream Processing with Apache Spark: Mastering Structured Streaming and Spark Streaming", O'Reilly, 2023.Reprint

Reference Books

1. Anindita Basak, Krishna Venkataraman, Ryan Murphy, Manpreet Singh, "Stream Analytics with Microsoft Azure", Packt Publishing, December 2017.
2. Streaming Data: Understanding the real time Pipeline, Andrew G Psaltis, 2017, Manning Publications.
3. Martin Kleppmann, Designing Data-Intensive Applications OReilly Media 2017. Publisher(s): *O'Reilly Media*.

FOREIGN LANGUAGE – I SYLLABUS

(II SEMESTER)

Note: Students should be given sufficient practice to acquire skillfor reading, writing and speaking words, numerals and simple sentences.

Subject Code	Subject Name : **FRENCH - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I01	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

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

CO1	Learn to write numbers, alphabets, regular and irregular verbs
CO2	Practice preposition and articles.
CO3	Comprehend model verbs and speak in future
CO4	Familiarize colours, places and create phrases
CO5	Master conjugation and speaking the language

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **FRENCH - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I01	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **6 Periods**

Les Salutations, Les Nombres (1-20), Les alphabets, Les Pronoms Sujets, Les Langues,Les Nationalités, Les Verbes : Parler, être, avoir,

UNIT II **6 Periods**

Les Nombres (21-100), L'heure, Les Pays, Les propositions des pays, Les articles définis,Les articles indéfinis, Les Verbes : s'appeler, Aimer et habiter.

UNIT III **6 Periods**

Les verbes : Aller, Venir, Les Articles Contractés, La Négation, Les Adjectifs Démonstratifs,Futur Prôche, Model Verbs, Adjectifs Possessifs.

UNIT IV **6 Periods**

Les articles partitifs, Les Verbes : Faire, Jouer. La Famille, Les Couleurs, Les lieux dans laville,

UNIT V **6 Periods**

Les Verbes: Lire, Écrire, Regarder, Voir, Écouter, Entendre

Total periods: 30

TEXT BOOKS:

1. Écho A1, J.Girardet & J.Pecheur, CLE International, 2nd Edition
2. Saison A1, Jean Giraudoux, Goyal publisher, 1st Edition

REFERENCE BOOKS:

1. Alter Ego A1, Veronique M Kizirian & Annie Berthet, Hachette, 1st Edition
2. Cosmopolite A1, Nathalie Hirschsprung & Tony Tricot, Goyal Publisher 1st edition

Subject Code	Subject Name : **GERMAN - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I02	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

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

CO1	Learn to write numbers, alphabets, regular and irregular verbs
CO2	Practice preposition and articles.
CO3	Comprehend model verbs and speak in future
CO4	Familiarize colours, places and create phrases
CO5	Master conjugation and speaking the language

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/ Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **GERMAN - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I02	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **6 Periods**

Das Alphabet, Die Zahlen von ein -hundert, Begrüßung,Verabschiedung ,Sich Vortstellen , W – Fragen. Grammatik :- W- Frage, Aussagasatz, Verban und Personnelpronomen

UNIT 2 **6 Periods**

Genders in Deutsch,,Die Personelpronomen, Definite /Indefinite / Negative Articles, Jemanden kennenlernen,Landkarte. Grammatik – bestimmter Artikel : der,die , das , Nomen: Singular und Plural, aussagesatz, negationartikel

UNIT 3 **5 Periods**

Possessivpronomen,Verbkonjugation, Ja/Nein Fragen, Satzstruktur Grammatik : Regelmäßige, Unregelmäßige, hilfsverben- Sein/haben, Unbestimmer Artikel

UNIT 4 **5 Periods**

Wie spät ist es, Tageszeiten, Die, Wochentage, Die Monate, das Wetter, Die Himmelsrichtungen,Die familie,Klassenzimmer – Substantive , Countries and Languages,Negation , Like /Dislike. Grammatik :Akkusative, Verbenmit accusative, wörterorden und lernen, artikelimdativ, Präpositionmit +Dativ

UNIT 5 **5 Periods**

Nominativ ,Dativ, Accusative, Einkaufen, Im Flugzueg, Im kaufhaus, Jobsuche. Grammatik

: Personalpronomen im Akkusativ mich, dich, modelverban müssen,können,wollen

Total periods: 30

TEXT BOOKS & REFERENCE BOOKS:

1. Shritte International, Daniela Niebisch, Fraz Sppeeht, Angela Pude

, Daniela Niebisch, Fraz Speeht, Angale Pude

2. Netzwerk A1, Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Siebe

EBFL23I02 GERMAN – I - Details in English for contents of each unit

Unit I **6 periods**

Alphabet- Numbers from 1 to 100 - Greetings and Goodbye - Self Introduction W questions - Grammar

Unit II **6 periods**

Genders in German - Personal Pronoun (For Conjugation) - Definite /Indefinite / Negative Articles - Ask about others - (MAP and Possition of Land) – Grammar

Unit III **6 periods**

Possessive Pronoun- Verb Conjugation - Yes /No Question - Sentence making in German – Grammar

Unit IV **6 periods**

what time is it ?, Times of the day - The Week days and Months) - The Weather, Directions - The Family - Substantive , Countries and Languages - Class Room – Substantive Countries and its Languages - Negation , Like /Dislike – Grammar

Unit V **6 periods**

Accusative - Shopping - In Flight - In departmental store - Job search Grammar

Total periods: 30

TEXT BOOKS & REFERENCE BOOKS:

1. Shritte International, Daniela Niebisch, Fraz Sppeeht, Angela Pude
, Daniela Niebisch, Fraz Speeht, Angale Pude
2. Netzwerk A1, Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber

Subject Code	Subject Name : **JAPANESE - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I03	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Learn to write Roumaji script, Able to self intro duce themselves, Will have knowledge of Hiragana and also able to speak about their Family members. Count up to 100.
CO2	Able to count up tp 10,000, Will have knowledge of Katakana Alphabets, Will be able identify the body parts. Able to understand pronouns.
CO3	Analyze Varied particles and also the existential verbs. Will be able to count using the concept of Counters.
CO4	Will get knowledge of the two different types of adjectives both I ending and Na ending adjectives and frame different sentences with these two.
CO5	Master the conjugation of 24 forms of the verbs.

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **JAPANESE – I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I03	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **5 Periods**

Introduction, Roumaji, Hiragana, Self Introduction, Family relations, Numbers (1-100)

UNIT II **5 Periods**

Numbers (101-1000), Numbers (1001-10,000), Katakana, Body parts, and Pronouns

UNIT III **8 Periods**

Introduction to particles (wa, mo, ka, desu, ni, ga, de), Imasu, Arimasu, Couters

UNIT IV **5 Periods**

Adjective i-ending, and Na Ending

UNIT V **7 Periods**

Verbs (24 forms)

Total periods: 30

TEXT BOOKS:

1. Genki, Eri Bnno, Yoka Ikeda, Yutaka Ohno, Chikkao Shinogawa, Kyoko Tokoshiki, The Japanese Publishing Company

REFERENCE BOOKS:

1. Minna No Nihongo, 3A Corporation, Goyal Publication

Subject Code	Subject Name : **ARABIC - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I04	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To learn, speak, write and do basic conversation in Arabic Language

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

CO1	Learn alphabets, vowels and gender
CO2	Ask questions, numerbs and counting
CO3	Converse in a public place in Arabic
CO4	Identify and speak about food, weather etc
CO5	Analyze verbs, tenses, singular and plural

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/ Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **ARABIC- I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I04	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **6 periods**

Alphabets – Greetings – question words – meeting people first time – introduction – introducing family members

Grammar – Present simple, long and short vowels, masculine and feminine distinctions

UNIT II **6 periods**

Asking questions -describing city, capital cities, towns countries – numbers and counting – how many – how much – buying and selling

Grammar – negation to present form – moon letters – genitive case – spelling rules for Hamza, Idafa

UNIT III **6 periods**

Eating and drinking – talking about ethnic foods anf favourite cuisines – communicative phrases at public places – questions with what

Grammar – Group words – past tense – plural and joint cases

UNIT IV **6 periods**

Describing weather – trips and adventures -camping – school trips

Grammar – future tense, verbs in plural

UNIT V **6 periods**

Time and everyday routine – making comparison – days of week – comparing past and present

Grammar – Negative statements – pronouns - superlatives

Total periods: 30

Text books & Reference books

1. The Essentials Arabic., Rafiel Imad Faynan., Arabic Edition Publisher
2. **Gateway to Arabic, Imran.H.Alawiye, Paperback publisher**

Subject Code	Subject Name : **CHINESE - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I05	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

This is a beginning level course in Chinese Mandarin, including introduction of phonetics and dailyexpressions. It is aimed at students with no prior knowledge of Chinese.

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

CO1	Basic understanding of Chinese Mandarin
CO2	Do conversations of daily living such as greetings
CO3	Acquaint exchange personal information, making an inquiry on time, etc
CO4	Acquire listening, speaking, and reading skills in Chinese Mandarin.
CO5	Use the language in real life scenarios and for everyday conversational communications.

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/ Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **CHINESE- I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I05	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **6 periods**

Introduction of Chinese language Initials and finals, read initials: b, p, m, f, d, t, n, l, g, k, hBe able to read finals: a, o, e, i, u, ü, ai, ei, ao, ou, an, en, ang, new words combined with tones greet people using: How do you do?

UNIT II **6 periods**

Initials: j, q, x, z, c, s, zhi, chi, shi, r finals: eng, ong, ia, iao, ie, -iu, ian, in, iang, ing, iong, ernew words combined with tones greet people using: How are you?

UNIT III **6 periods**

Finals: ua, uo, uai, ui, uan, uen, un, uang, ueng, üe, üan, ün

New words combined with tones o count numbers count date, month and year greet peopleusing: Are you busy with your work?

UNIT IV **6 periods**

New words questions with "吗" questions with interrogative pronouns adjectival predicate acquaintance using: May I know your name?

UNIT V **6 periods**

Sentences with a verbal predicate attributive genitive use the "是" sentence acquaintanceusing: Let me introduce..

Total periods: 30

Textbooks and Reference Books

1. The first 100 Chinese Characters, Laurence Mathews, Tuttle Publishers
2. Learning Mandarin Chinese, Version2, Yi Ren, Tuttle Publishers

Subject Code	Subject Name : **RUSSIAN - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I06	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

This is a beginning level course in Chinese Mandarin, including introduction of phonetics and daily expressions. It is aimed at students with no prior knowledge of Chinese.

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Acquaint Phonetics – Alphabets and sounds
CO2	Use different types of nouns and self introduce.
CO3	Identify general vocabulary and greet in the language
CO4	Identify and apply sounds with different stems and word construction
CO5	Construct and speak sentences in the language

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **RUSSIAN- I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I06	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **6 periods**

Phonetics: Alphabets and Sounds, Voice and vowels, Voice and Voiceless – Consonants -Self Intro, Self Name in Russian Language

UNIT II **6 periods**

Etho construction, Shtho Etho, Kmo Etho - Animates and Inanimate nouns

UNIT III **6 periods**

General Vocabulary, Answering the objects with Etho on interrogatives Shtho Etho and Kmotho? - Greetings of the Day on various timings

UNIT IV **6 periods**

Alphabets , sounds with Hard stems - Gender of Nouns, Demonstrative Pronouns using vocabulary and simple word constructions - General words on regular us: Excuse me, May I Come in, Excuse me, Thank you and see you again

UNIT V **6 periods**

Revision of Vocabulary, New Words, Greetings and other Day to day usage of sentences

Total periods: 30

Textbooks & Reference Books

1. Russian for begineers, Gateway Guides, Kindle Edition
2. Learn to speak & Write Russian, Vasuda Bhaskar, Chatter Singh Publishers.

Subject Code	Subject Name : **SPANISH - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I07	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

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

CO1	Learn to write numbers, alphabets, regular and irregular verbs
CO2	Practice preposition and articles.
CO3	Comprehend model verbs and speak in future
CO4	Familiarize colours, places and create phrases
CO5	Master conjugation and speaking the language

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **SPANISH - I**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I07	Prerequisite : Nil	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **5 periods**

Los Saludos y Despedidas, Los Alfabetos, Los Numeros (1-20), Sonidos y Letras: H, C/Qa,G/J, B/V, C/Z, R, R/rr, Ch, G/Gu, Ll, N, Aficiones.

UNIT II **5 periods**

Los Numeros (21-100), Pronombres Personales: Yo, Tu, El, Eyya, Nosotros, Vosotros, Ustedes, Usted. Ser verbos: Soy, Eres, Es, Somos, Sois, Son. Nacionalidad, Profesiones.

UNIT III **5 periods**

Singular y Plural, Conversion de Singular a Plural. Masculinoy Feminino, conversion de masculino afeminino. Tener verbos: Tengo, Tienes, Tiene, Tenemos, Teneis, Tienen. Llevarverbos.

UNIT IV **10 periods**

Vocabulario de Colores, Casa, Bebidas, Ciudad, Clima, Colegio, Comida, Medios, Saludos, Verduras. Articulesdefinidos, Articulesindefinidos.

UNIT V **5 periods**

Estar verbos: Estoy, Estas, Esta, Estamos, Estais, Estan. Reflexive verbos: Me, Te, Se, Nos, Os, Se. Cuantificadores, Preguntar y Responder.

Total periods: 30

TEXT BOOK:

1. Aula internacional 1, Jaime corpas & Eva Garcia, diffusion, Nueva edicion

REFERENCE BOOK:

1. Grammatica de uso A1-B2, Luis Aragones, Ramon Palencia, smeLe, Nueva edicion

EBFL23I07 SPANISH – I - Details in English for contents of each unit

UNIT-I **6 periods**

Introduction of Spanish words through the greetings, goodbyes, hobbies. Simple vocabulary like numbers (1 – 20) and alphabets. Pronunciation of H, C/Qa, G/J, B/V, C/Z, R, R/rr, Ch, G/Gu, Ll, N are taught.

UNIT – II **6 periods**

Focusing on grammatical elements like subject pronouns and irregular verbs. Completevocabulary for numbers, Nationality and professions. Therefore, practice how to say time, phone number, Nationality and profession.

UNIT – III **6 periods**

Singular and plural forms of noun and conversion from singular to plural. Identifying the nouns as masculine or feminine. Conversion of nouns from masculine to feminine. Focusing on Tener and Llevar verbs.

UNIT – IV **6 periods**

Learning vocabulary in most common categories like colours, Houses, Drinks, City, Climate, Foods. Learning both definite and indefinite articles. More focusing on reading, writing and speaking.

UNIT – V **6 periods**

More focusing on grammatical elements like Estar verbs and Reflexive verbs usually used in everyday life, Quantification like much , more .More familiarity towards language is therefore attained.

Total periods: 30

TEXT BOOK:

1. Aula internacional 1, Jaime corpas & Eva Garcia, diffusion, Nueva edicion

REFERENCE BOOK:

1. Grammatica de uso A1-B2, Luis Aragones, Ramon Palencia, smeLe, Nueva edicion

FOREIGN LANGUAGE – II
SYLLABUS

(V SEMESTER)

Note: Students should be given sufficient practice to acquire skillfor reading, writing and speaking words, adjectives, tenses and sentences of all types.

Subject Code	Subject Name : **FRENCH - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I08	Prerequisite : French I	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

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

CO1	Identify future verbs, pronouns etc
CO2	Express hobbies such as sports etc in the language
CO3	Analyze active and passive voices
CO4	Use articles and express views on travel, food etc in the language
CO5	Use French grammar and construct sentences to speak in daily routines

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/ Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **FRENCH - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I08	Prerequisite : French I	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **5 Periods**

FuturProche, PronomsToniques, Les Verbes : Devoir, Pouvoir, Vouloir, Savoir. Le Vocabulaire : Les Loisirs (Sports, Spectacles et Activités)

UNIT II **10Periods**

Passé Composé, Le voix Active et Passive, Comparaison, Adjectifs Possessifs.

UNIT III **5Periods**

Les Articles Partitifs, Emploi des Articles, Le Vocabulaire : Les Voyages, Les Transports, La nourriture, La Forme possessive : <<à + pronom>>

UNIT IV **5 Periods**

Le ConjugaisonPronominale, L'Impératifs, L'expression de la quantité, Les activitésquotidiennes, Les achats, L'argent

UNIT V **5 Periods**

Prépositions et adverbes des lieux, L'Imparfait, Les moments de la vie, La famille, Emploi dupassé composé et de l'imparfait, L'enchainement des idées (alors, donc, mais)

Total periods: 30

TEXT BOOKS:

1. Écho A1, J.Girardet & J.Pecheur, CLE International, 2nd Edition
2. Saison A1, Jean Giraudoux, Goyal publisher, 1st Edition

REFERENCE BOOKS:

1. Alter Ego A1, Veronique M Kizirian & Annie Berthet, Hachette, 1st Edition
2. Cosmopolite A1, Nathalie Hirschsprung & Tony Tricot, Goyal Publisher 1st edition

EBFL23I08 FRENCH – II - Details in English for contents of each unit

Unit-1 **6 periods**

Near Future, Tonique Pronouns, Verbs : Devoir, Pouvoir, Vouloir, Savoir.Vocabulary: Hobbies (Sports, Shows and Activities)

Unit-2 **6 periods**

Simple Past, Active voice and Passive Voice, Comparatives, Possessive pronouns.

Unit-3 **6 periods**

Les Articles Partitifs, Usage of Articles, Vocabulary: Travel, Transport, Food, Possessiveforms with: <<à + pronom>>

Unit-4 **6 periods**

Conjugation of Reflexive Verbs, Imperatives, Expressions of quantities, Daily Life Activities,Buying and Selling, Money

Unit-5 **6 periods**

Prepositions and adverbs of places, Past continuous, Moments of Life, The Family, Usage ofSimple past and past continuous, Linking words in sentences (alors, donc, mais)

Total periods: 30

TEXT BOOKS:

1.Écho A1, J.Girardet & J.Pecheur, CLE International, 2nd Edition

2.Saison A1, Jean Giraudoux, Goyal publisher, 1st Edition

REFERENCE BOOKS:

1.Alter Ego A1, Veronique M Kizirian & Annie Berthet, Hachette, 1st Edition

2.Cosmopolite A1, Nathalie Hirschsprung & Tony Tricot, Goyal Publisher 1st edition

Subject Code	Subject Name : **GERMAN - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I09	Prerequisite :German I	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

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

CO1	Speak about countries, shopping etc in Russian language
CO2	Write and tell numbers uoto million
CO3	Express views about daily routine, weather etc
CO4	Identify verbs, clauses, noun as indicator of time
CO5	Analyze grammar and put into use in daily life

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **GERMAN - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I09	Prerequisite :German I	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT 1 **6 periods**

Deutschprachige Länder, Adresse, Meine Familie, Labensmittel einkaufen, Meine Wohnung, Das Zimmer ist nicht groß, Zahlen von hunder zu eine million.

UNIT 2 **6 periods**

Die Pronomen und Verben, Verben Stamm endung mit "s", "ss", "ß", "x" or "z" , Genders und Artikel, Mein Tag, Tageszeiten, Montag bis Freitag. Geschlecht der Substantive, Wohenende , Freizeit und Hobbys, wetter – Grammatik : Akkusativ : bestimmter Artikel, Akkusativ: unbestimmter Artikel

UNIT 3 **6 periods**

Kinder und Schule, Akkusativ unbestimmter Artikel, Tagesablauf, Stress im Büro, Am Computer, Termine vereinbaren, Die Jahreszeiten und das Wetter , Tagesablauf, Stress im Büro, Am Computer

UNIT 4 **6 periods**

Verben Grundlagen der Zeitform , Die Gruppe der Substantive , Die Verneinung , Hauptsätze und Nebensätze . Verben mit Dativ und Akkusativ; Konjunktiv II ; Substantive als Indikatoren der Zeit, Kasus

UNIT 5 **6 periods**

Grammatik : Präpositionen der Zeit, Satzverknüpfungen: Konjunktionen, Die Gruppe der Substantive, Indikatoren für den Raum,AdjektiveVisuelle Klasse für das Hören

Total periods: 30

TEXT BOOKS & REFERENCE BOOKS:

1.Shritte International, Daniela Niebisch, Fraz Sppeeht, Angela Pude, Daniela Niebisch, Fraz Speeht, Angale Pude

2.Netzwerk A1, Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber

Subject Code	Subject Name : **GERMAN II – CONTENTS IN ENGLISH**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I09	Prerequisite :German I	**IE**	**1**	**0/0**	**1/0**	**1**

Unit I **6 periods**

German-speaking countries, Address, My family, shopping for groceries, my apartment, the room is not big, Numbers from a hundred to a million

Unit II **6 periods**

The pronouns and verbs, verbs ending with "s", "ss", "ß", "x" or "z", genders and articles, my day, times of day, Monday to Friday. Gender of nouns, Wohenende, Freizeit und Hobbys, wetter - Grammar: Akkusativ : definite article, Akkusativ: indefinite article

Unit III **6 periods**

Children and school, Daily routine, Stress in the office, At the computer, Making appointments, The seasons and the weather, Daily routine, Stress in the office, At the computer

Unit IV **6 periods**

Verb tense basics , The group of nouns , The negation , Main clauses and subordinate clauses Verbs with dative and accusative; subjunctive II; nouns as indicators of time, case

Unit V **6 periods**

Grammar: Prepositions of time, Sentence linking: Conjunctions, The group of nouns, Indicators of space, Adjectives - Visual class for hearing

Total periods: 30

TEXT BOOKS & REFERENCE BOOKS:

1.Shritte International, Daniela Niebisch, Fraz Sppeeht, Angela Pude, Daniela Niebisch, Fraz Speeht, Angale Pude

2.Netzwerk A1, Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber

Subject Code	Subject Name : **Japanese - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I10	Prerequisite :Japanese - I	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

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

CO1	Develop the skill of crafting sentences employing adjectives with both 'i' and 'na' endings, alongside formulating suggestion plans using various verb forms.
CO2	To Enhance the ability to express daily actions using diverse verb forms, construct sentences or engage in dialogue to request objects from others, and formulate sentences to prohibit certain actions.
CO3	Master the utilization of continuous tense to describe daily habits, while also comprehending the usage of conjunctions with different verb forms.
CO4	Gaining familiarity with informal speech patterns, employing the dictionary form of verbs for informal communication, and grasping the concept of expressing desires for objects and actions involving those objects.
CO5	Crafting sentences in the past tense to narrate past daily activities and acquiring knowledge about conjunctions such as 'because'.

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **Japanese– II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I10	Prerequisite : Japanese - I	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **5 Periods**

Grammer paterns Te form, Te moiidesu, Te ha ikemasen, te kara, mashouka.

UNIT II **3 Periods**

Te imasu, Continuoustense, te kudasai

UNIT III **7 Periods**

Te iku, Counting people

UNIT IV **8 Periods**

Informal speech (dictionaryform)Using the particle « ga » Verbs forms like and dislike, negative form te kudasai

UNIT V **7 Periods**

Past tense, - karaform (because), qualifying nouns with verbs and adjectives.

Total periods: 30

TEXT BOOKS:

1.Genki, Eri Bnno, Yoka Ikeda, Yutaka Ohno, Chikkao Shinogawa, Kyoko Tokoshiki, The Japanese Publishing Company

REFERENCE BOOKS:

1.Minna No Nihongo, 3A Corporation, Goyal Publication

Subject Code	Subject Name : **ARABIC- II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I11	Prerequisite : Arabic - I	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

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

CO1	Express views about school, college, subjects, future plans etc.
CO2	Converse with Friends and family, identify colurs and clothes
CO3	Explain daily routine and works in Arabic language
CO4	Write resume and apply for jobs
CO5	Talk about various activities like sports etc

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **ARABIC - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I11	Prerequisite :Arabic I	**IE**	**1**	**0/0**	**1/0**	**1**

Unit I **6 Periods**

Familiarization about school and at university – talking about subjects – future plans –months of the year

Grammar – Past negation and future negation

Unit II **6 Periods**

Talking about yourself – about nationality and friends – describing character – talking about childhood experiences

Grammar – review of pronoun and past tense

Unit III **6 Periods**

Work and routine – talking about work - typical day of work – writing resume and applyingjobs

Grammar – Review of present form

Unit IV **6 Periods**

Talking about sports and outside activities – free time activities Grammar – verbal nouns and participles

Unit V **6 Periods**

Clothes and colour- writing reviews and opinions – food and cookingGrammar – Doubled verbs and negation

Total periods: 30

Text books & Reference books

1. The Essentials Arabic., Rafiel Imad Faynan., Arabic Edition PublisherGateway to Arabic, Imran.H.Alawiye, Paperback publisher

Subject Code	Subject Name : **CHINESE - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I12	Prerequisite : Chinese I	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

This is a beginning level course in Chinese Mandarin, including introduction of phonetics and daily expressions. It is aimed at students with no prior knowledge of Chinese.

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

CO1	basic understanding of Chinese Mandarin
CO2	basic conversations of daily living such as greetings
CO3	making an acquaintance, exchanging personal information, making an inquiry on time, etc
CO4	gain training in listening, speaking, and reading skills in Chinese Mandarin.
CO5	real life scenarios and can be used for everyday conversational communications.

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **CHINESE- II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I12	Prerequisite : Chinese I	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **5 periods**

Sounds and tones Daily conversations Difficult point Role Play using conversations learnt

UNIT II **5 periods**

New words Be able to use sentences with a nominal predict Be able to use the question tag"…, 好吗？" Be able to make an inquiry about days of a week When is your birthday? Difficult point Ask about the year, the month, the day and the days of a week

UNIT III **5 periods**

Be able to read new words Be able to use the "有" sentence Be able to use prepositionalconstructions Be able to make an inquiry about and introduce family members. 8.3 Key point(s) and difficult point(s) Key point learn to use the "有" sentence difficultpoint Introduce family members

UNIT IV **10 periods**

Be able to read new words Be able to use time as subjects, predicates, and attributives. Beable to make an inquiry about time.

UNIT V **5 periods**

Key point Conversations Difficult point Express ideas using conversations learned

Total periods: 30

Textbooks and Reference Books

1.The first 100 Chinese Characters, Laurence Mathews, Tuttle PublishersLearning Mandarin Chinese, Version2, Yi Ren, Tuttle Publishers

Subject Code	Subject Name : **RUSSIAN - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I13	Prerequisite : Russian-I	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

This is a beginning level course in Chinese Mandarin, including introduction of phonetics and daily expressions. It is aimed at students with no prior knowledge of Chinese.

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	basic understanding of Chinese Mandarin
CO2	basic conversations of daily living such as greetings
CO3	making an acquaintance, exchanging personal information, making an inquiry on time, etc
CO4	gain training in listening, speaking, and reading skills in Chinese Mandarin.
CO5	real life scenarios and can be used for everyday conversational communications.

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **RUSSIAN- II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I13	Prerequisite : Russian-I	**IE**	**1**	**0/0**	**1/0**	**1**

UNIT I **5 periods**

Singular & Plurals, Formation of Plural nouns with a hard stem - Personal and Possesive Pronouns and exercises- Russian lessons reading and writing

UNIT II **5 periods**

Construction of sentences with KTHO ECTH, Negation with HIYATH & HE - Pointing of objects ON/VA/ Thooth & Thaam - Names of the Months, Numerical, Names of the Week in Russian Language

UNIT III **5 periods**

Verb Conjugations: Chitaat, Slushat, Igraath - Interrogatives Shtho, Gde, KudA, Kogda, Kakaya, Chei, and answering the questions - Verbs with particles and conjugations

UNIT IV **10 periods**

General concept of Verb aspects - Tenses, Verbs of motions - Short form of Adjectives

UNIT V **5 periods**

Accusative3 case with explanation and examples - Instumental case with explanation and examples - Complex sentences - Direct and indirect sentences - Reading Texts and translation and Viva - Reading and writing practice and Revision

Total periods: 30

Textbooks & Reference Books

1. Russian for begineers, Gateway Guides, Kindle Edition
2. Learn to speak & Write Russian, Vasuda Bhaskar, Chatter Singh Publishers.

Subject Code	Subject Name : **SPANISH - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I14	Prerequisite :Spanish I	**IE**	**1**	**0/0**	**1/0**	**1**

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

OBJECTIVES

To understand the main idea and some detailed aspects of complex and unfamiliar texts.
Know emerging awareness of aesthetic properties of language and literary style.
Recognize the role of cultural knowledge in understanding written texts.

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

CO1	Learn to write numbers, alphabets, regular and irregular verbs
CO2	Practice preposition and articles.
CO3	Comprehend model verbs and speak in future
CO4	Familiarize colours, places and create phrases
CO5	Master conjugation and speaking the language

Mapping of Course Outcome with Program Outcome (POs)

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

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

Category	Basic Sciences	Engg.Science	Humanities & Social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/ Technical Skills	Soft Skills
			√						

Subject Code	Subject Name : **SPANISH - II**	Ty/ Lb/ ETL/IE	L	T/SLr	P/R	C
EBFL23I14	Prerequisite :Spanish I	**IE**	**1**	**0/0**	**1/0**	**1**

UNIDAD – I **5 HRS**

El Abecedario – a saludar y a despedidas – Las nacionalidades – las profesiones y sobre las palabras - LosNumeros (1- 100) – La presentacion – hablar – dias de la semana y meses.

UNIDAD – II **5 HRS**

Sobretemporadasen Espanol yotrapaises – pronombrepersonales – articulesdefinidos, indefinidos y sus usos – verbosregulares – Hablar, comer, vivir con oraciones de ejemplo – conversion de singular a plural-Identificando masculine o femenino.

UNIDAD – III **5 HRS**

Verbos irregulars mas frequentes – Ser, Estar, Ir, Tener, Decir, Poder, Querer,Pedir, Conocer con oraciones de ejemplo – Los Numerous 1000 y vocabulario – Numeros – Telefonicos – direcciones cardinals y medios de transporte – preguntarpordirecciones y describer un camino.

UNIDAD – IV **6 HRS**

El Vocabulariode Animales – Avion – Cuerpo – Familia – Deporte – Geografia – Aficiones

– Colores, Casa – Bebidas – Ciudad – Clima – Colegio –Ropa – Saludos – Tiempo – Transporte.

UNIDAD – V **4 HRS**

A hablar de Clima – Explicar: Un/Una/Unas/Unos y oraciones – Explicar: Mucho/Muha/Muchos/Muchasy oraciones – preguntas: Que/ Cual/ Cuales/ Cuantos/ Cuantas/Donde- Escuchar y escribir

Total periods: 30

TEXT BOOK:

1. Aula internacional 1, Jaime corpas & Eva Garcia, diffusion, Nueva edicion

REFERENCE BOOK:

1. Grammatica de uso A1-B2, Luis Aragones, Ramon Palencia, smeLe, Nueva edicion

EBFL23I14 SPANISH – II - Details in English for contents of each unit

UNIT-1

The Alphabets – Greetings and goodbyes related words – nationality in Spanish and other languages – profession and related vocabulary – speaking about days of the week and months.

UNIT-2

Speaking about seasons in Spanish and other languages – personal pronouns – definite and indefinite articles and their regular uses – Regular verbs in Spanish – to speak – to eat – to live – to wear – to carry – to take with example sentences. Converting singular to plural – identifying masculine and feminine words.

UNIT-3

Most frequent irregular verbs – to be – go – have – say – can – want – ask – know – with example sentences – the numbers up to 1000 related vocabulary – speaking about door number, age, telephone numbers – directions and transport related vocabulary – ask for directions and describing about path.

UNIT-4

Vocabulary of animals – plane – body – family – sports – geography – hobbies – colours – House – drinks – city – climate – school - collage – cloths – greetings – weather – transportations with example sentences.

UNIT-5

Talk about seasons – different forms of one and example sentences- Many, More, Much with example sentences – what, which, where, how, how many why questions and answers – listening and writing related sentences.

Total periods: 30

TEXT BOOK:

1. Aula internacional 1, Jaime corpas & Eva Garcia, diffusion, Nueva edicion

REFERENCE BOOK:

1. Grammatica de uso A1-B2, Luis Aragones, Ra