KPR Institute of Engineering and Technology

Learn Beyond (Autonomous, NAAC "A")

Avinashi Road, Arasur, Coimbatore.

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VI Semester – Open Electives Syllabi

B.E. / B.Tech. Programme Regulations – 2021

REGULATIONS – 2021

B.E. / B.Tech. Programme

VI SEMESTER – OPEN ELECTIVES

SYLLABI

SL. NO.	COURSE CODE	COURSE TITLE
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE		
1.	U21ADX05	Foundations of Data Analytics
2.	U21ADX08	Natural Language Processing
DEPARTMENT OF BIOMEDICAL ENGINEERING		
1.	U21BMX05	Medical Informatics
2.	U21BMX06	Telemedicine
DEPARTMENT OF CHEMICAL ENGINEERING		
1.	U21CHX05	Industrial Management
2.	U21CHX06	Membrane Technology
DEPARTMENT OF CIVIL ENGINEERING		
1.	U21CEX05	Environment and Agriculture
2.	U21CEX08	E – Waste Management
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
1.	U21CSX05	User Interface Design
2.	U21GEX01	Digital Engineering
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)		
1.	U21AMX04	AI in Healthcare
DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS		
1.	U21CBX05	Brand Management
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING		
1.	U21ECX05	Sensors for Engineering Applications
2.	U21ECX08	Fundamentals of VLSI Technology
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING		
1.	U21EEX05	Battery Technology
2.	U21EEX08	Energy Audit

DEPARTMENT OF INFORMATION TECHNOLOGY		
1.	U21ITX05	Social Media Security
2.	U21ITX06	Enterprise Resource Planning
DEPARTMENT OF MECHANICAL ENGINEERING		
1.	U21MEX05	Automotive Systems
2.	U21MEX06	Low Cost Automation
DEPARTMENT OF MECHATRONICS ENGINEERING		
1.	U21MIX05	Product Design and Development
2.	U21MIX06	Introduction to Industrial Internet of Things
3.	U21MIX07	Graphical System Design Using LabVIEW
SCIENCE & HUMANITIES		
1.	U21MAX02	Linear Programming Problems

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEMESTER VI

		Category: OEC				
U21ADX05	FOUNDATIONS OF DATA ANALYTICS	L	T	P	L	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic R Programming Constructs and Visualization
- To understand and apply Exploratory Data Analytics using Data Visualization
- To understand and apply Inferential Statistics and Regression Models

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Describe the basics and fundamental data handling techniques in R (Understand)

CO2: Use the various types of functions in R for data manipulation (Apply)

CO3: Implement data cleaning and data visualization methods in R (Apply)

CO4: Define various data types, data dimensions and Numerical measures (Understand)

CO5: Describe data standardizing and error handling methods (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	1	-	-	-	-	-	-	-		
CO2	3	2	2	2	2	-	-	-	-	-	-	-		
CO3	3	2	2	2	2	-	-	-	-	-	-	-		
CO4	3	2	1	1	1	-	-	-	-	-	-	-		
CO5	3	2	1	1	1	-	-	-	-	-	-	-		
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SYLLABUS:

UNIT I GETTING DATA USING R 9

Introduction to R – Getting Data into R – Concatenating Data with C function – Combining Variables with the c, cbind, rbind functions – Vector Function – Matrix – Data frame – List – Importing Excel Data – Accessing Data from other Statistical Packages – Accessing the Database

UNIT II FUNCTIONS IN R 9

Functions – The Attach Function – Exporting Data – The Tapply Function – The Supply and Lapply Function – The Summary and Table Function – Importing Data – CSV, Excel, Table, Xml, Json, Databases Conditional – Control flow – Loops – A Function with Multiple Arguments

UNIT III DATA CLEANING AND VISUALIZATION 9

Cleaning Data – Exploring raw data: Missing values, Zeros and NAs – Separating – Uniting columns – R visualization packages: Lattice – ggplot2 – Plotly – Seaborn – Histogram – Box plot, Density

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plot, Scatter plots – Plot function – Pie chart, Bar and Strip chart, Cleveland dot plots – Reporting – Data preparation – Labelling and reusing code chunks

UNIT IV DATA TYPES, INSIGHTS AND INFERENCES 9

Data types: Categorical, Binary, Ordinal, Nominal, Continuous, Discrete – Data dimensions: Univariate, Bivariate, Multivariate – Numerical measures: Central tendency, Mean, Median, Mode – Variability measure: Variance, Range, IQC, Standard deviation, Sum of squares – Squared deviations – Absolute deviations – Identify outlier using Inter quartile range

UNIT V HANDLING ERROR 9

Data standardizing: Z score, Negative Z score – Continuous distributions – Compute proportions – Normalized distribution using – Ztable – Probability distributions: Probability of mean, Location of mean distribution, Sampling distributions – Standard error – Standard deviation of sampling distribution – Ratio of sampling distribution – Central Limit Theorem R – Simple regression analysis – Multiple regression ANNOVA model – Parametric test - Non parametric test

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Roger D. Peng, "R Programming for Data Science", 1st Edition, Lean Publishing, 2014
2. Hadley Wickham, "R for Data Science: Import, Tidy, Transform, Visualize, and Model Data", 1st Edition, O'Reilly Media Publisher, ISBN: 9781491910399, 2017

REFERENCES:

1. Brett Lantz, "Machine Learning with R", 3rd Edition, ISBN: 9781788295864, 2019
2. Kaelen Medeiros, "R Programming Fundamentals", ISBN: 9781789612998, 2018
3. Vitor Binanchi Lanzetta, "Hands-On Data Science with R", ISBN: 9781789139402, 2018
4. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", 2nd Edition, Pearson Education Publisher, ISBN: 9789386873521, 2018
5. https://www.datacamp.com/tracks/r-programming
6. https://www.tutorialspoint.com/r/index.htm
7. https://www.datamentor.io/r-programming/

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEMESTER VI

		Category: OEC				
U21ADX08	NATURAL LANGUAGE PROCESSING	L	T	P	L	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To classify the text and information extraction
- To acquire knowledge in basics of dialog system and learning algorithms
- To apply the natural language processing in various real-world applications

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Describe the fundamentals of Natural Language Processing (Understand)

CO2: Classify the text with different models (Understand)

CO3: Illustrate the entity recognition and linking (Understand)

CO4: Interpret the components of a dialog System (Understand)

CO5: Illustrate various applications through Natural Language Processing (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	-	-	-	-	-	-	-	2		
CO2	3	2	1	1	-	-	-	-	-	-	-	2		
CO3	3	2	1	1	-	-	-	-	-	-	-	2		
CO4	3	2	1	1	-	-	-	-	-	-	-	2		
CO5	3	3	3	2	-	-	-	-	-	-	-	2		

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

SYLLABUS:

UNIT I INTRODUCTION 9

NLP: An overview – Approaches – Data acquisition – Text extraction: Unicode normalization, Spelling correction – Pre-processing: Preliminaries, Frequent steps – Feature engineering: ML, DL Pipeline – Modeling – Evaluation – Post modeling phases

UNIT II TEXT REPRESENTATION AND CLASSIFICATION 9

Vector space models – Vectorization approaches – Distributed representation – Universal representations – Building text classification – Classifiers: Naïve Bayes, Logistic regression – SVM – Neural embeddings – Deep learning – Interpreting models

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UNIT III INFORMATION EXTRACTION 9

Information extraction tasks – Key phrase extraction: Implementation – Named entity recognition – Named entity disambiguation and linking: Azure API – Relationship extraction: Watson API, Advanced IE tasks

UNIT IV NLP ESSENTIALS 9

Chatbots: Taxonomy – Dialog systems – Components of a dialog system – Dialog pipelines – Rasa NLU – Information retrieval –Topic modeling – Text summarization – Recommender system – Machine translation

UNIT V APPLICATIONS 9

Social Media: NLP for social data, Memes and Fake news – E-Commerce and Retail: Search, Building, Review analysis -- Healthcare, Speech processing – Sentimental analysis

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Sowmya Vajjala, Majumder, Anuj Gupta, Harshit Surana, "Practical Natural Language Processing: A Comprehensive Guide to building Real-World NLP systems", 1st edition, O'Reilly Media, 2020
2. Aman Kedia and Mayank Rasu, "Hands-On Python Natural Language Processing", 1st edition, Packt Publishing Ltd., 2020

REFERENCES:

1. Nitin Indurkhya, Fred J Damerau, "Handbook of Natural Language Process", 2nd Edition, CRC Press, 2010
2. Bing Liu, "Sentiment Analysis and Opinion Mining", 1st edition, Morgan & Claypool Publishers, 2012
3. Dan Jurafsky and James H. Martin, "Speech and Language Processing An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", 3rd edition, Pearson, 2023

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF BIOMEDICAL ENGINEERING

SEMESTER VI

		Category: OEC				
U21BMX05	**MEDICAL INFORMATICS**	**L**	**T**	**P**	**J**	**C**
		3	**0**	**0**	**0**	**3**

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce the basic concepts in biomedical informatics and its applications in electronic medical record system and medical standards
- To learn about healthcare informatics in the medical field and to apply the standards in proper health care delivery
- To teach the various medical informatics tools and explore the databases available in NCBI

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Infer the overview of medical informatics (Understand)

CO2: Interpret the basics of healthcare informatics and the resources in the field (Understand)

CO3: Explore and apply the various medical informatics tools and databases available in NCBI (Apply)

CO4: Illustrate the clinical decision support systems (Understand)

CO5: Comprehend the applications of an electronic medical record system (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	2	-	-	-	-		
CO2	3	2	1	-	-	-	-	3	-	-	-	-		
CO3	3	2	1	-	-	-	1	3	-	-	-	-		
CO4	3	2	2	-	-	-	2	3	-	1	-	-		
CO5	3	2	1	-	-	-	2	2	-	1	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I OVERVIEW OF MEDICAL INFORMATICS 9

Introduction – Biomedical Data - their Acquisition, Storage, and Use – Computer Architectures for Health Care and Biomedicine – Medical informatics – Bioinformatics – Health informatics – Structure of medical informatics – Hospital information system – Characteristics – Functional online and offline modules

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UNIT II MEDICAL STANDARDS AND ELECTRONIC PATIENT RECORD 9

Evolution of medical standards – HL7 – DICOM – PACS – Electronic patient records – Healthcare standard organizations – JCAHO – JCIA – Steganography – Virtual hospital

UNIT III MEDICAL DATA STORAGE AND AUTOMATION 9

Medical data formats – Signal – Image and video formats – Representation of data – Data modeling techniques – Relational hierarchical and network approach – Normalization techniques for data handling – Plug-in data acquisition and control boards

UNIT IV HEALTH INFORMATICS 9

Bioinformatics databases – Bio information technologies – Semantic web and bioinformatics – Genome project – Clinical informatics – Nursing informatics – Public health informatics – Education and training

UNIT V RECENT TRENDS IN MEDICAL INFORMATICS 9

Medical expert systems – Virtual reality applications in medicine – Virtual environment – Surgical simulation – Radiation therapy and planning – Telemedicine – Virtual hospitals – Smart medical homes – Personalized e-health services – Biometrics – GRID and cloud computing in medicine

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Aboul Ella Hassanien, Roheet Bhatnagar, Václav Snášel and Mahmoud Yasin Shams, "Medical Informatics and Bioimaging Using Artificial Intelligence: Challenges, Issues, Innovations and Recent Developments", 1st edition, Springer, 2022
2. Yi Ping Phoebe Chen, "Bioinformatics Technologies", 1st edition, Springer, 2014
3. Godbole.A.S, Kahate.A, "Web Technologies TCP/IP to Internet Application Architectures", 1st edition, TMH Publication, 2007

REFERENCES:

1. Orpita Bosu, Simminder Kaur Thukral, "Bioinformatics Databases, Tools and Algorithms", 1st edition, Oxford University press, 2007
2. Mohan Bansal, "Medical informatics", 1st edition, Tata McGraw Hill Publishing Ltd, 2003

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF BIOMEDICAL ENGINEERING

SEMESTER VI

		Category: OEC				
U21BMX06	**TELEMEDICINE**	**L**	**T**	**P**	**J**	**C**
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn the principles of telemedicine
- To understand the concept of PACS
- To apply tele medicine in the different fields of hospital

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Explain the concept of telemedicine and its scope (Understand)

CO2: Describe the different communication technologies in telemedicine (Understand)

CO3: Illustrate the significance of mobile telemedicine (Understand)

CO4: Outline the concept of PACS and its architecture (Apply)

CO5: Identify the applications of telemedicine in healthcare (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	2	-	-	-	-	-	-		
CO2	3	1	-	-	-	-	-	-	-	-	-	-		
CO3	3	1	2	-	-	2	-	-	-	-	-	-		
CO4	3	1	-	-	-	-	-	-	-	-	-	-		
CO5	3	1	-	-	-	2	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)					3: Substantial (High)						

SYLLABUS:

UNIT I FUNDAMENTALS OF TELEMEDICINE 9

Introduction – Definition of Telemedicine, Telehealth and Telecare – Origin and Development of Telemedicine – Future of Telemedicine – Types of Telemedicine – Teleconsultation, Tele-education, Telemonitoring, Telesurgery – Patients and Carers – Benefits and Limitations of Telemedicine

UNIT II TECHNOLOGY OF TELEMEDICINE SYSTEM 9

Types of telemedicine information – Compression – Frame rate and bandwidth – Telecommunication standards – Components of telecommunication system – Public Switched Telephone Network (PSTN) – Satellite – Wireless technology – Store and forward operation – Real time telemedicine

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UNIT III MOBILE TELEMEDICINE 9

Tele radiology – Tele pathology – Multimedia databases – Compression methods – Interactive control of color – Medical information storage and management for telemedicine – Hospital information system – Pharmaceutical information system

UNIT IV PICTURE ARCHIVING AND COMMUNICATION SYSTEM, HL7 AND DICOM 9

Picture Archiving and Communication System (PACS) Components – PACS Infrastructure Design Concept - PACS Workflow – PACS Architecture – PACS Server and archive - PACS and Teleradiology – Industrial standards: HL7 and DICOM

UNIT V APPLICATION OF TELEMEDICINE 9

Robotic surgery – Telesurgery – Telecardiology – Telemedicine in neurosciences – Electronic documentation – E-health services - Security and interoperability – Business aspects – Project planning – Usage of telemedicine

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Rifat Latifi, Charles R. Doarn, Ronald C. Merrell, "Telemedicine, Telehealth and Telepresence: Principles, Strategies, Applications, and New Directions", 1st edition, Springer, 2021
2. Khandpur R S, "TELEMEDICINE – Technology and Applications II", 1st edition, PHI Learning Pvt Ltd., New Delhi, 2017
3. H K Huang, "PACS and Imaging Informatics: Basic Principles and Applications II", 1st edition, Wiley, New Jersey, 2010

REFERENCES:

1. Olga Ferrer Roca, Marcelo Sosa Iudicissa, "Handbook of Telemedicine", 1st edition, IOS Press, Netherland, 2002
2. Norris A C, "Essentials of Telemedicine and Telecare II", 1st edition, John Wiley, New York, 2002

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		**Assessment II (100 Marks)**			
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	**Total Internal Assessments**	**End Semester Examinations**
40	**60**	**40**	**60**	**200**	**100**
Total				**40**	**60**
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF CHEMICAL ENGINEERING

SEMESTER VI

		Category: OEC				
U21CHX05	INDUSTRIAL MANAGEMENT	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the strategic planning and effective supply chain
- To know about the organizational behavior and group dynamics
- To understand the concept of SWOT analysis

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Gain knowledge on the basic management principles to become a professional (Understand)

CO2: Understand the modern concepts of management (Understand)

CO3: Understand about the organizational structures in detail (Understand)

CO4: Implement the performance appraisal in their working system (Understand)

CO5: Manage human behavior and leadership qualities (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	2	-	-	-	-	1	-	-		
CO2	3	2	-	-	2	-	-	-	-	1	-	-		
CO3	3	2	-	-	2	-	-	-	-	1	-	-		
CO4	3	2	-	-	2	-	-	-	-	1	-	-		
CO5	3	2	-	-	2	-	-	-	-	1	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I INTRODUCTION TO MANAGEMENT 9

Management – Definition – Functions – Evolution of modern management – Scientific management – Joint stock companies – Co-operative enterprises – Public sector undertakings – Corporate frame work – Shareholders – Board of directors – Committees – Chief Executives – Trade union

UNIT II FUNCTIONS OF MANAGEMENT 9

Planning – Nature and purpose – Objectives – Strategies – Policies and Planning premises – Decision making – Organizing – Organizational culture – Staffing – Selection and training – Placement – Performance appraisal – Career strategy – Organizational development – Leading – Managing human factor – Leadership – Communication – Controlling

UNIT III ORGANIZATIONAL BEHAVIOUR 9

Definition – Organization – Managerial role and Functions – Organizational approaches – Individual behavior – Causes – Environmental effect – Behavior and performance – Job satisfaction – Learning and behavior – Learning curves – Work design and approaches

UNIT IV GROUP DYNAMICS 9

Group behavior – Groups – Contributing factors – Group norms – Communication – Process – Barriers to communication – Effective communication – Organization centralization and decentralization – Formal and Informal – Organizational structures – Organizational change and development – Change process – Resistance to change – Culture and Ethics

UNIT V MODERN CONCEPTS 9

Management by Objectives (MBO) – Management by Exception (MBE) – Strategic Management – Planning for future direction – SWOT Analysis – Information technology in management – Decisions support system – Activity based management (ABM)

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total 45 Periods

TEXT BOOKS:

1. Herald Knotts and Heinz Weihrich, "Essentials of Management", 11th edition, McGraw-Hill Education, New Delhi, 2012
2. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, "Organization Behaviour", 16th edition, Pearson Education Inc, 2016

REFERENCES:

1. James A. F. Stoner and Edward Freeman R, "Management", 5th edition, Prentice Hall of India, New Delhi, 1994
2. Joseph L. Massie, "Essentials of Management", 4th edition, Pearson India, 2015
3. Tripathi P.C and Reddy P. N, "Principles on Management", 4th edition, McGraw-Hill Education, New Delhi, 2008

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EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		**Assessment II (100 Marks)**		**Total Internal Assessments**	**End Semester Examinations**
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test		
40	**60**	**40**	**60**	**200**	**100**
Total				**40**	**60**
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose any one / two components based on the nature of the course.

24/01/24

(Dr. S. [illegible])
ASP/[illegible]

SEMESTER VI

		Category: OEC				
U21CHX06	MEMBRANE TECHNOLOGY	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To know about applications of reverse osmosis, ultra filtration and microfiltration.
- To know about applications of gas separation and pre evaporation.
- To know about ion exchange, electro dialysis and medical applications

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Understand about an overview of membrane technology (Understand)

CO2: Know about various membrane technologies and their applications (Understand)

CO3: Interpret the applications of membrane technologies with the industry (Understand)

CO4: Know about various types of membranes used in industry (Understand)

CO5: Serve the water purification industry (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	3	3	-	-	-	-	-		
CO2	2	-	-	-	-	3	3	-	-	-	-	-		
CO3	2	-	-	-	-	3	3	-	-	-	-	-		
CO4	2	-	-	-	-	3	3	-	-	-	-	-		
CO5	2	-	-	-	-	3	3	-	-	-	-	-		
CO	2	-	-	-	-	3	3	-	-	-	-	-		

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

SYLLABUS:

UNIT I INTRODUCTION TO MEMBRANE SCIENCE AND TECHNOLOGY 9

Introduction, Historical Development of Membranes, Types of Membranes, Membrane Processes. Solution-diffusion Model, Structure–Permeability Relationships in Solution-diffusion Membranes, Pore-flow Membranes. Isotropic Membranes, Anisotropic Membranes, Metal Membranes and Ceramic Membranes, Liquid Membranes, Hollow Fiber Membranes, Membrane Modules. Boundary Layer Film Model, Determination of the Peclet Number.

UNIT II REVERSE OSMOSIS 9

Membranes and Materials, Reverse Osmosis Membrane Categories, Membrane Selectivity, Membrane Modules, Membrane Fouling Control, Membrane Cleaning, Applications.

UNIT III ULTRAFILTRATION AND MICROFILTRATION 9

Characterization of Ultrafiltration Membranes, Concentration Polarization and Membrane Fouling, Membrane Cleaning, Membranes and Modules, Applications. Microfiltration and its Applications.

UNIT IV GAS SEPARATION AND PERVAPORATION 9

Gas separation: Membrane Materials and Structure, Membrane Modules, Applications. Pervaporation: Membrane Materials and Modules, Applications.

UNIT V ION EXCHANGE, ELECTRODIALYSIS AND MEDICAL APPLICATIONS 9

Chemistry of Ion Exchange Membranes, Transport in Electrodialysis Membranes, Applications. Medical applications: Hemodialysis, Blood Oxygenators, Controlled Drug Deliver.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total 45 Periods

TEXT BOOKS:

1. Membrane Technology and Applications, 2nd Ed., by Richard W. Baker, John Wiley & Sons, 2000.
2. Water Treatment Membrane Processes, by American Water Works Association Research Foundation, McGraw-Hill, 1996.

REFERENCES:

1. Microltration and Ultraltration, by Leos J. Zeeman and Andrew L. Zydney, Marcel Dekker, Inc., 1996.
2. Sustainable Water for the Future: Water Recycling versus Desalination, eds.: Isable Escobar, Andrea Schafer, Elsevior, 2010.
3. Basic Principles of Membrane Technology, 2nd Ed., by Marcel Mulder, Kluwer Academic Publishers, 2000

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose any one / two components based on the nature of the course.

Dr. S. Uthayakumar
(Applied)

KPRIET
Learn & Beyond

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER VI

		Category: OEC				
U21CEX08	E – WASTE MANAGEMENT	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the scenario of e-waste
- To demonstrate the recent technologies, in handling of the e-wastes
- To explain the scope of waste management audits

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Outline the global scenario of e-waste (Understand)
CO2: Infer on laws and legislation for e-waste management (Understand)
CO3: Demonstrate the significance and benefits of conducting e-waste management audits (Understand)
CO4: Illustrate the disposal techniques of e-waste (Understand)
CO5: Summarize the integrated e-waste management (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	3	3	2	-	-	1	-		
CO2	2	1	-	-	-	3	3	2	-	-	1	-		
CO3	2	1	-	-	-	3	3	2	-	-	1	-		
CO4	2	1	-	-	-	3	3	2	-	-	1	-		
CO5	2	1	-	-	-	3	3	2	-	-	1	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

SYLLABUS:

UNIT I INTRODUCTION **9**

E-Waste – Definition, Types of waste, E waste hazardous properties – Indian and global scenario of e-Waste – Growth of Electrical and Electronics industry in India – E-waste generation in India, Composition of e-waste, Possible hazardous substances present in e-waste – Occupational, Environmental and Health implications.

UNIT II LAWS AND LEGISLATION **9**

Regulatory regime for e-waste in India, hazardous waste (Management and Handling) rules – E-waste management rules – Regulatory compliance including roles and responsibility of different stakeholders – producer, manufacturer, consumer etc., – Proposed reduction in the use of hazardous substances (RoHS), Extended producer responsibility (EPR).

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UNIT III SCOPE OF E-WASTE MANAGEMENT AUDITS 9

Essentials for E-Waste Disposal audit – Essential disposal steps for these e-waste items – Case studies – Auditing exercises, Audited site visits and demonstrations, Audits groundwork, checklist preparation, Practical auditing and auditing techniques – Audit conformity and non-conformity report preparation, Action Plan and Suggestions for Waste Reduction in the Organization.

UNIT IV END-OF-LIFE TECHNIQUES 9

Historic methods of waste disposal – Dumping, burning, landfill – Recycling and recovery technologies – Sorting, crushing, separation – Life cycle assessment of a product – Introduction – Case study – Optimal planning for computer waste

UNIT V INTEGRATED E-WASTE MANAGEMENT 9

Emerging recycling and recovery technologies – Principles for the Responsible and Sustainable Handling of Electronic Waste – Sustainable Technology for the Eco-Friendly Treatment of Electronic Waste – Guidelines for establishment of integrated e-waste recycling and treatment facility – Case studies and unique initiatives around the world.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Johri R., "E-waste: implications, regulations, and management in India and current global best practices", TERI Press, 2nd Edition, New Delhi, 2008.
2. Hester R.E., and Harrison R.M, "Electronic Waste Management" RSC Publishing, 4th Edition, 2009.
3. Gnanamangai, B. M., Murugananth, G. and Rajalakshmi, S, "A Manual on Environment Management Audits to Educational Institutions and Industrial Sectors", Laser Park Publishing House, Coimbatore, Tamil Nadu, India, 1st Edition, 2021.

REFERENCES:

1. Fowler B, "Electronic Waste (Toxicology and Public Health Issues)", Elsevier publications, 1st Edition, 2017.
2. Rajalakshmi, S., Kavitha, G. and Vinoth Kumar, D., "Energy and Environment Management Audits", AkiNik Publishing, New Delhi, India, 2nd Edition, 2021.
3. Pramanik, A.K., "Environmental Audit and Indian Scenario", Environmental Accounting and Reporting, Deep and Deep Publications, New Delhi, India, 6th Edition, 2013.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Designer can choose any one / two components based on the nature of the course.

Head of the Department
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DEPARTMENT OF CIVIL ENGINEERING

SEMESTER VI

		Category: OEC				
U21CEX05	ENVIRONMENT & AGRICULTURE	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To emphasize the importance of environmental and agriculture on changing global scenario and emerging issues connected to it
- To learn the various instrumental methods of monitoring the quality of air, water and soil
- To understand the role of agricultural and irrigation engineers in relation to various crop production practices

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Summarize various biotic and abiotic environmental transformation processes of pollutants (Understand)
CO2: Understand the various aspects of ecology (Understand)
CO3: Identify air pollution problems and interpret air quality data on chemical characteristics (Understand)
CO4: Relate plant growth regulators and environmental stresses (Understand)
CO5: Choose right crop for the given soil conditions and climate (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	1	-	1	-	-	2	-		
CO2	-	-	-	-	-	1	-	1	2	-	2	-		
CO3	1	2	2	3	-	1	3	1	2	-	2	-		
CO4	1	2	2	3	-	1	3	1	2	-	2	-		
CO5	1	2	2	-	2	1	-	1	2	3	2	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I GENERAL CONSIDERATION 9

Basis concepts – Biotic and Abiotic environment – Adverse effects of environment pollution – Control strategies – Environmental Act and regulation – International concern for environment – Environmental protection laws in India

UNIT II ECOLOGY 9

Objectives of ecology study – Classification of various aspects of ecology-Balanced ecology – Habitat ecology-Function of concepts of ecology – Food chain – Food web- Basics of species – Bio diversity and wildlife conservation – Ecosystem

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UNIT III ENVIRONMENTAL POLLUTION 9

Classification – Air pollution – Domestic and industrial – Solid waste, biomedical waste – Agricultural pollution – Thermal pollution – Treatment and remedial measures

UNIT IV AGRICULTURE AND CROP PRODUCTION 9

Introduction to agriculture and its crop production sub-sectors – Field crop production and horticulture – Factors affecting crop growth and production – Genetic (internal) and environmental (external) factors – Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices

UNIT V CROP SELECTION AND ESTABLISHMENT 9

Regional and seasonal selection of crops – Systems of crop production – Competition among crop plants – Spacing and arrangement of crop plants – Field preparation for crops including systems of tillage – Establishment of an adequate crop stand and ground cover, including selection and treatment of seed, and nursery growing

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods
Total: 45 Periods

TEXT BOOKS:

1. Kaushik. C.P, S.S. Bhavikatti, Anubha Kaushik, "Basic Civil and Environmental Engineering", New age international publishers. New Delhi, 8th Edition, 2010.
2. Howard S Peavy, Donald R Rowe, George Tchobanoglous, "Environmental Engineering", New York : McGraw-Hill, 4th Edition,1985.
3. Mahua, Basu and Xavier Savarimuthu SJ, "Fundamentals of Environmental Studies", 3rd Edition, 1970.

REFERENCES:

1. Kiran Bisht Nidhi Gauba Dhawan, "Environmental Studies Challenge and Solutions", Dream tech Press, 5th Edition, 2001.
2. R.J. Ranjit Daniels and Jagdish Krishnaswamy "Environmental Studies", Wiley publications, 1st Edition, 2005.
3. Dr. P.D. Sharma "Ecology and Environment". Rastogi Publications, 6th Edition, 2000.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		**Assessment II (100 Marks)**		**Total Internal Assessments**	**End Semester Examinations**
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	**60**	**40**	**60**	**200**	**100**
Total				**40**	**60**
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Designer can choose any one / two components based on the nature of the course.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER VI

U21CSX05	USER INTERFACE DESIGN	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To explore the significance of user interface design in software systems
- To gain proficiency in the user interface design process
- To develop Skills in designing system menus and navigation schemes

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Explain the basics of User Interface (Understand)

CO2: Discuss the process of user interface design and business requirements (Understand)

CO3: Utilize various menu and navigation methods for effective user interface design (Apply)

CO4: Incorporate windows and its operations in interface design (Apply)

CO5: Design user interface using screen based controls (Apply)

CO-PO MAPPING

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	-	-	-	-	-	-	-	1		
CO2	2	1	1	1	-	-	-	-	-	-	-	1		
CO3	3	2	2	2	-	-	-	-	-	-	-	2		
CO4	3	2	2	2	-	-	-	-	-	-	-	2		
CO5	3	2	2	2	-	-	-	-	-	-	-	2		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

SYLLABUS:

UNIT I THE USER INTERFACE 9

The User Interface-Introduction – Overview – The importance of user interface – Defining the user interface – The importance of Good design – Characteristics of graphical and web user interfaces – Principles of user interface design

UNIT II THE USER INTERFACE DESIGN PROCESS 9

The User Interface Design process – Obstacles – Usability – Human characteristics in Design – Human Interaction speeds – Business functions – Business definition and requirement analysis – Basic business functions – Design standards

UNIT III SYSTEM MENUS AND NAVIGATION SCHEMES 9

System menus and navigation schemes – Structures of menus – Functions of menus – Contents of menus – Formatting of menus – Phrasing the menu – selecting menu choices – Navigating menus – Kinds of graphical menus

UNIT IV WINDOWS 9

Windows - Characteristics – Components of window – Window presentation styles – Types of window – Window management, organizing window functions – Window operations – Web systems – Characteristics of device based controls

UNIT V SCREEN BASED CONTROLS 9

Screen based controls – Operable control – Text control – Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Wilbent. O. Galitz, "The Essential Guide to User Interface Design", John Wiley& Sons, Third Edition, 2007
2. Ben Shneiderman, Catherine Plaisant, Maxine S. Cohen, Steven M. Jacobs, Niklas Elmqvist, "Designing the User Interface Strategies for Effective Human-computer Interaction", Pearson Publisher 2017

REFERENCES:

1. Larry E Wood, "User Interface Design: Bridging the Gap from User Requirements to design", CRC Press, 2018
2. Alan Cooper, "The Essential of User Interface Design", Wiley- Dream Tech Ltd., 2002

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

Head of the Department
Department of Computer Science and Engineering
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SEMESTER VI

U21GEX01	DIGITAL ENGINEERING	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To study and design emerging technologies for industrial applications
- To understand the concepts of edge, IoT, Cybersecurity, AI/ML and BDA to solve real-world applications

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Understand the basics of emerging technologies (Understand)

CO2: Create job-ready talent for the ER&D Industry (Apply)

CO3: Describe all algorithms and represent it (Understand

CO4: Design a real-world industry application (Apply)

CO5: Analyse all the algorithm and evaluate their performance (Apply)

CO-PO MAPPING

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	1		
CO5	3	2	-	-	-	-	-	-	-	-	-	1		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)					3: Substantial (High)						

SYLLABUS:

UNIT I EDGE COMPUTING **14**

IoT Edge Computing Solutions – Edge Security – Edge Protocols – IoT Edge Computing Architecture – Enterprise Edge (Edge Computing in Enterprises) – Edge Analytics – Deployment of Edge Microservices – Edge Event-Driven Data Management – Building Edge Microservices – Introduction to Edge – Microservices-Building an Edge Network for Microservices Architectures – Building a Hybrid Edge Network – Securing your Edge Network Traffic – Scaling your Edge Network Design

Building an Edge to Cloud and Cloud to Edge Network – Edge 2 Edge & Edge 2 Cloud Networking and Communication – NFV and end-to-end service orchestration in Edge Computing – IEEE Standards for Software Engineering-Developing Software for Edge Computing Applications – Requirement Engineering for Edge Computing – Develop Edge Computing Applications – Create Your First Prototype – Edge Services Discovery-Consumer IoT Use Cases – Building Edge Content Delivery Networks

UNIT II INTERNET OF THINGS 8

IoT - Interfacing with Hardware – Internet of Things (IOT) Overview – IoT Application Platform – Enterprise IoT adoption in Businesses-Connected Car – IoT Reference Architecture – IoT in Retail – Introduction to LoRaWAN – IoT Analytics – Enterprise IoT Implementation Questionnaire (IoT is new IT for Enterprises) – IoT Sensors and Device Layer

UNIT III CYBERSECURITY 8

Important aspects of IoT Security – IoT Cloud & App security – IoT Endpoint Security – OT Security – Introduction – Vulnerability assessment and Penetration Testing-Introduction to Cyber Security – Intrusion Detection System – An Introduction to Hardware Security – An Introduction to Data Security – Introduction to IoT Security – OT Security Risk Assessment – OT Security Risks

UNIT IV ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING 10

Introduction – Dimensionality Reduction – Introduction to Text Analytics – Introduction to Text Analytics – Machine Learning Clustering – Regression in AI/ML-Classification in AI/ML – Exploratory Data Analysis – Sampling and Hypothesis Testing – Deploying and Managing AI Applications – Introduction to Deep Learning-Introduction to Data Science – Data Analytics – Types of Distributions, Data Types, and EDA – Fundamentals of Deep Learning – Basic Statistics Probability and Linear Algebra

UNIT V BIG DATA ANALYTICS 5

Basics of Big Data-Big Data: ELT Fundamental Components – Big Data Security Fundamentals – Data Engineering – Processing, Storage, and Capacity Planning – Data Types and NoSQL DB Architecture

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total 45 Periods

TEXT BOOKS:

1. William J. Dally, John W. Poulton, "Digital Systems Engineering", Cambridge University Press, Third Edition, 2018

REFERENCES:

1. G. K. Kostopoulos, "Digital Engineering", CRC Press, 2008

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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KPRIET

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AIML)

SEMESTER VI

U21AMX04	AI IN HEALTHCARE	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To provide students with a comprehensive understanding of AI and Machine Learning in Healthcare
- To familiarize students with the tools and techniques used in healthcare data analysis and analytics
- To teach students the principles and techniques of machine learning models used in healthcare
- To provide students with an understanding of the real-time applications of AI in healthcare
- To equip students with knowledge of the challenges and ethical considerations in AI in healthcare

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Understand the principles and applications of AI in Healthcare (Understand)

CO2: Apply techniques of healthcare data analysis and analytics for effective decision-making (Apply)

CO3: Apply supervised and unsupervised learning techniques to healthcare data (Apply)

CO4: Design and develop ML models for healthcare data (Apply)

CO5: Evaluate the effectiveness and limitations of AI in Healthcare (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-		
CO2	2	2	-	-	-	3	-	-	-	-	-	-		
CO3	2	2	-	-	-	2	-	-	-	-	-	-		
CO4	2	2	-	-	-	3	-	2	2	-	2	-		
CO5	2	2	-	-	-	3	-	2	2	-	2	-		
Correlation levels:	1: Slight (Low)					2: Moderate (Medium)					3: Substantial (High)			

SYLLABUS:

UNIT I INTRODUCTION TO HEALTHCARE 9

Overview of AI – Applications in healthcare – Ethical considerations in AI healthcare – Machine learning and deep learning in healthcare – Types of healthcare data – Data pre-processing and cleaning techniques – Feature extraction and selection – Analytics for healthcare data

UNIT II MEDICAL IMAGING AND DIAGNOSIS 9

Image processing and analysis for medical imaging – Applications of machine learning and deep learning in medical imaging – Real time implementation of image recognition and diagnosis using deep learning

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UNIT III ELECTRONIC HEALTH RECORDS AND DATA ANALYTICS 9

Introduction to electronic health records (HER) and data analytics – Challenges in EHR data analysis and management – Techniques for EHR analysis – Real time implementation of EHR data analysis using machine learning

UNIT IV MACHINE LEARNING MODELS FOR HEALTHCARE 9

Supervised and unsupervised learning techniques for healthcare data – Classification and prediction models – Clustering and segmentation models – Model evaluation and selection techniques

UNIT V TELEMEDICINE AND REMOTE MONITORING 9

Introduction to telemedicine – Remote monitoring – Analytics for remote patient monitoring – Real time implementation of remote patient monitoring using ML – Clinical decision support systems – Personalized medicine and treatment planning – Medical imaging and analysis – Case Study

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXTBOOKS:

1. Adam Bohr and Jesse Davis, "Artificial Intelligence in Healthcare", 1st edition, Springer, 2020.
2. Sanjay Saxena and Shakti Kapoor, "Machine Learning for Healthcare Technologies: Fundamentals and Applications", 1st edition, Wiley, 2021

REFERENCES:

1. Jeff Heaton, "Machine Learning and Healthcare Analytics Made Simple: Strategies for Implementing Machine Learning in Healthcare", 1st edition, CreateSpace Independent Publishing Platform, 2019
2. G. S. Ooi and S. K. Dhillon, "Big Data Analytics in Healthcare", 1st edition, Springer, 2020
3. S. Kevin Zhou, "Deep Learning for Medical Image Analysis", 1st edition, Academic Press, 2018

EVALUATION PATTERN:

<table>
<tr><th colspan="4">Continuous Internal Assessments</th><th rowspan="2">Total Internal Assessments</th><th rowspan="3">End Semester Examinations</th></tr>
<tr><th colspan="2">Assessment I (100 Marks)</th><th colspan="2">Assessment II (100 Marks)</th></tr>
<tr><td>*Individual Assignment / Case Study / Seminar / Project / MCQ</td><td>Written Test</td><td>*Individual Assignment / Case Study / Seminar / Project / MCQ</td><td>Written Test</td><td></td></tr>
<tr><td>40</td><td>60</td><td>40</td><td>60</td><td>200</td><td>100</td></tr>
<tr><td colspan="4" rowspan="2">Total</td><td>40</td><td>60</td></tr>
<tr><td colspan="2">100</td></tr>
</table>

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose anyone / two components based on the nature of the course.

22-1-24

Dr. S. Karthikeyan, M.E.,Ph.D.
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LEARN BEYOND

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

SEMESTER VI

U21CBX05	BRAND MANAGEMENT	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce unique ideas, products and solutions
- To apply comprehend global trends influencing the business environment
- To familiarize creating new ideas and combine multiple perspectives to develop new solutions

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Understand the original ideas with minimal guidance and implement solutions with strong evidential support (Understand)

CO2: Illustrate multiple idea creation techniques and combine multiple perspectives to develop new solutions (Understand)

CO3: Describe the decisions using multiple international information sources (Apply)

CO4: Apply and appreciate cultural differences with the available information while making decisions (Apply)

CO5: Summarize the consequences of intercultural communication and propose sensitive ways of communicating in the given context (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	-	1		
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CO3	3	2	2	2	2	-	-	-	-	-	-	2		
CO4	3	2	2	2	2	-	-	-	3	-	-	2		
CO5	3	3	3	3	3	-	-	-	3	-	-	2		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I BASICS OF BRAND MANAGEMENT 9

Brands vs Products – Branded offerings – Branding goods – Services – People – Location – Ideas – Digital Brands – Strategic Brand management process.

UNIT II BUILDING BRAND EQUITY 9

Customer based Brand equity – Brand Knowledge –Building brands –Keller's pyramid model –Aaker's

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Professor & Head
Department of Computer Science and Business Systems
KPR Institute of Engineering and Technology
Arasur, Coimbatore - 641407.

and Kapferer's models.

UNIT III CREATING BRANDS 9

Brand Positioning – Core brand associations – Brand Essence and Brand Mantra – Brand elements – Role of Semiotics – Brand Auditing.

UNIT IV BRAND EQUITY AND BRANDING STRATEGIES 9

Measuring Brand equity – Brand Value chain – Brand tracking studies- Quantitative and qualitative research for brand valuation. Brand strategy – Brand Architecture and hierarchy – Brand extensions and new brands – Co-branding – Reinforcing, revitalizing and adjusting brand portfolio – Challenges and trends.

UNIT V MARKETING PROGRAMS AND BRAND COMMUNICATION 9

Marketing Programs to build brand equity-Product – Pricing and channel strategy- Digital and conventional brand communication.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Kevin Lane Keller, M.G, Parameswaran MG, Jacob Isaac, "Strategic Brand Management", 4th Edition, Pearson education, 2018.
2. Laura Busche, "Lean Branding - Creating Dynamic Brands to Generate Conversion", Shroff Publishers and Distributors Pvt. Ltd, 2019.

REFERENCES:

1. Jean Noel Kapferer, "The New Strategic Brand Management", 1st Edition, Kogan Page India Pvt Ltd, 2017.
2. Harsh V. Verma , "Brand Management Text and Cases", 1st Edition, Excel Books, 2019.
3. Rajendra K. Srivastava, Gregory Metz Thomas, "The Future of Branding", 1st Edition, New Delhi, Sage Publications India Pvt. Ltd, 2018.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER VI

		Category: OEC				
U21ECX05	SENSORS FOR ENGINEERING APPLICATIONS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic concepts of sensor based measurement systems
- To learn about the different types of sensors
- To acquaint the students with selection of sensors for particular field of application

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Explain the basic concepts of sensor based measurement system (Understand)
CO2: Illustrate the operation of thermal and optical sensors (Understand)
CO3: Summarize the principles of electrical and high frequency sensors (Understand)
CO4: Select suitable biosensor for various biomedical applications (Apply)
CO5: Utilize appropriate sensor for civil engineering applications (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	2	-	-	2		
CO2	2	-	-	-	-	-	-	-	2	-	-	2		
CO3	2	1	-	-	-	-	-	-	2	-	-	2		
CO4	3	2	2	-	-	-	-	-	2	-	-	2		
CO5	3	3	2	-	-	-	-	-	2	-	-	2		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I FUNDAMENTALS OF SENSORS **9**

Methods of measurement – Direct methods, Indirect methods – Instruments – Mechanical, electrical and electronic instruments – Applications of measurement systems – Sensor classification – Materials for sensors

UNIT II THERMAL AND OPTICAL SENSORS **9**

Thermal sensors – Temperature, temperature difference, heat quantity – Thermometers for different situation – Thermocouples – Thermistors – Color pyrometry – Optical sensors – Light intensity, wavelength and color, light dependent resistors, photodiode, photo transistor, CCD, CMOS sensors

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UNIT III ELECTRICAL AND HIGH FREQUENCY SENSORS 9

Electrical sensors – Conventional volt and ammeters, high current sensors (current transformers), high voltage sensors, high power sensors, high frequency sensors – Microwave frequency sensors – Wavelength measuring sensors – MEMS and MEMS based sensors

UNIT IV BIOSENSORS FOR BIOMEDICAL ENGINEERING 9

Introduction to biosensors – Biological inspiration – Biosensors and diabetes management – Micro fabricated biosensors and point-of-care diagnostics systems – Non-invasive biosensors in clinical analysis – Biosensor in cancer and HIV early diagnosis

UNIT V STRUCTURAL HEALTH MONITORING IN CIVIL ENGINEERING 9

Introduction – Principle – Capacitance probe for cover concrete – Applications for external post – tensioned cable – Capacitance probe for moisture monitoring in historic buildings

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Jeong-Yeol Yoon, "Introduction to Biosensors", 1st edition, Springer-Verlag New York,2013
2. Sawhney A.K., "A Course in Electrical and Electronic Measurement and Instrumentation", 7th edition, Dhanpat Rai & Co, 2010

REFERENCES:

1. Daniel Balageas, Claus-Peter Fritzen and Alfredo Güemes, Structural Health Monitoring, 1st Edition, John Wiley & sons, USA, 2010
2. Jocob Fraden," Handbook of Modern Sensors, Physics, Designs, and Applications", Springer, 2010
3. Doebelin E.O., "Measurement Systems: Applications and Design", 4th edition, Tata McGraw Hill, 2004
4. Julian W. Gardner, Vijay K. Varadan, Osama O. Awadelkarim "Microsensors, MEMS and Smart Devices", Reprint 2001, New York: Wiley, 2001

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER VI

		Category: OEC				
U21ECX08	FUNDAMENTALS OF VLSI TECHNOLOGY	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn the basics of MOS transistor theory
- To implement combinational and sequential circuits using HDL
- To familiarize about the testing and verification methods

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Explain the principles of MOS devices (Understand)

CO2: Apply the concepts of combinational and sequential circuits (Apply)

CO3: Summarize the features of Hardware Description Language (Understand)

CO4: Implement the digital circuits using hardware description language (apply)

CO5: Outline the hardware testing and verification (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-		
CO2	3	2	1	-	-	-	-	-	-	-	-	-		
CO3	2	-	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	1	-	3	-	-	-	-	-	-	-		
CO5	2	-	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

SYLLABUS:

UNIT I MOS TRANSISTOR THEORY 9

MOSFET characteristics under static and dynamic conditions – Enhancement NMOS transistor operation and drain to source current expression – Long channel I-V characteristics – C-V characteristics – Non-ideal effects – DC transfer characteristics – Static CMOS inverter characteristics

UNIT II COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS 9

Combinational logic – Static CMOS Design – Complementary CMOS – Ratioed Logic – Pass-Transistor Logic – Dynamic CMOS Design – Dynamic Logic – Sequential logics – Static latches and registers – Dynamic latches and registers

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UNIT III HARDWARE DESCRIPTION LANGUAGE 9

Hardware Modelling with Verilog HDL – Logic System – Data types and Operators – Modeling – Dataflow – Structural – Behavioral

UNIT IV IMPLEMENTATION OF DIGITAL CIRCUITS 9

Realization of combinational and sequential circuits using Verilog – Registers – Counters – Sequential machine – Serial adder – Full adder – Full subtractor – Multiplexer and demultiplexer

UNIT V TESTING AND VERIFICATION 9

Testing vs Verifications – Design and Verifications – Functional verification approach – Formal verification approach – Test generation – DFT schemes – Built in Self-Test

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Jan M. Rabaey, Anantha Chandrakasan, Borivoje. Nikolic, "Digital Integrated Circuits: A Design perspective", 2nd edition, Pearson, 2016.
2. Samir Palnitkar, "Verilog HDL – A Guide to Digital Design and Synthesis", 2nd edition, Pearson, 2003

REFERENCES:

1. Neil H.E. Weste, David Money Harris , "CMOS VLSI Design: A Circuits and Systems Perspective", 4th edition, Pearson, 2011
2. D.A. Hodges and H.G. Jackson, "Analysis and Design of Digital Integrated Circuits", International Student edition, McGraw Hill 1983
3. Sze S.M., "VLSI Technology", McGraw Hill, New York, 2nd edition, 2008
4. Janik Bergeron "Writing Test Benches: Functional Verification of HDL models", 2nd edition, Springer 2003

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)			
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	Total Internal Assessments	End Semester Examinations
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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SEMESTER VI

		Category: OEC				
U21EEX05	BATTERY TECHNOLOGY	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge on energy storage technologies
- To understand the construction, operation and testing of batteries
- To apply the safety aspects of high voltage batteries

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Describe the fundamentals of electro chemical energy storage systems (Understand)
CO2: Explain the construction and operation of primary batteries (Understand)
CO3: Summarize the fabrication and performance of secondary batteries (Understand)
CO4: Infer various testing methods of batteries (Understand)
CO5: Illustrate the safety aspects of high voltage batteries (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	1	-	-	-	-	-	-	1		
CO2	3	2	1	-	-	-	-	-	-	-	-	1		
CO3	3	2	1	-	-	-	-	-	-	-	-	1		
CO4	3	2	1	-	1	-	-	-	-	-	-	1		
CO5	3	2	1	-	1	-	-	-	-	-	-	1		

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

SYLLABUS:

UNIT I ELECTROCHEMICAL ENERGY STORAGE 9

Electromotive force – Reversible cells – Relation between electrical energy and energy content of a cell – Free energy changes in cell – Current challenges in energy storage technologies

UNIT II PRIMARY BATTERY 9

Dry cells and alkaline batteries – Fabrication techniques – Voltage data – Ohmic load curve – Effect of operating temperature – Rating – Service time and life – Safety

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UNIT III SECONDARY BATTERY 9

Lead acid batteries – Construction – Working principle – Characteristics – SOC – SOH – DOD – Recent developments – Solid state batteries – Applications

UNIT IV BATTERY TESTING 9

Constant current and constant voltage methods – Hybrid methods – Inductive chargers – Battery power testing for various vehicles – Testing for urban and highway driving cycles

UNIT V SAFETY ASPECTS OF HIGH VOLTAGE BATTERIES 9

Code and standards – Safe handling of Lithium - ion batteries – Safety of high voltage devices – Fundamentals of battery management systems and control

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Kirby W. Beard, "Linden's Handbook of Batteries", 5th edition, Mc Graw-Hill education, 2019
2. Albert N Link, Alan C O'Connor and Troy Scott, "Battery Technology for Electric Vehicles", 1st edition, Earthscan from Routledge, 2015

REFERENCES:

1. Xianxia Yuan, Hansan Liu, Jiujun Zhang, "Lithium-Ion Batteries: Advanced Materials and Technologies", 1st edition, CRC press, Taylor and Francis group, New York, 2011
2. Iqbal Husain, "Electric and Hybrid Vehicles", 2nd edition, CRC press, Taylor and Francis group, New York, 2011
3. Westbrook M H., "The Electric Car: Development and Future of Battery, Hybrid and Fuel – cell Cars", Warrandable PA, 1st edition, Society of Automotive Engineering, 2001

EVALUATION PATTERN:

Continuous Internal Assessments				Total Internal Assessments	End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)			
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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SEMESTER VI

U21EEX08	ENERGY AUDIT	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge on energy scenario, conservation and its policies
- To understand the concepts of energy management and audit procedures
- To understand the energy efficiency in electrical and thermal utilities

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Explain the energy scenario, conservation and policies (Understand)

CO2: Infer the energy management and audit process (Understand)

CO3: Summarize the financial and project planning techniques (Understand)

CO4: Interpret the energy efficiency in electrical utilities (Apply)

CO5: Illustrate the energy efficiency in thermal utilities (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	2	2	2	-	-	-	1		
CO2	3	2	-	-	1	1	2	2	-	-	-	1		
CO3	3	2	-	-	-	1	2	2	-	-	1	1		
CO4	3	2	-	-	1	1	2	2	-	-	-	1		
CO5	3	2	-	-	1	1	2	2	-	-	-	1		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I ENERGY SCENARIO, ENERGY CONSERVATION ACTS AND POLICIES **9**

Primary and secondary energy – Commercial and non-commercial energy – Energy consumption – Indian energy scenario – Energy conservation: Importance –Features of energy conservation Act – Schemes of BEE – Electricity Acts – Integrated energy policy – National action plan on climate change.

UNIT II ENERGY MANAGEMENT AND ENERGY AUDIT **9**

Energy Management – Need for energy audit – Types – Costs – Benchmarking –Instruments and metering for audit – Audit procedures and time intervals – Case study

UNIT III FINANCIAL AND PROJECT MANAGEMENT **9**

Financial analysis techniques – Cash flow – Sensitivity and risk analysis – Financing options – ESCOs – Project development cycle – Project planning techniques

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UNIT IV ENERGY EFFICIENCY IN ELECTRICAL UTILITIES 9

Types of Motors – Energy Efficiency: Fan, Blowers, Pumps, HVAC and Lighting System – Energy Efficient Motors - Case Study.

UNIT V ENERGY EFFICIENCY IN THERMAL UTILITIES 9

Fuels: Types – Properties – Combustion – Energy Efficiency: Boiler and types– Steam System – Furnace and types– Heat Exchangers – Case Study.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. "General Aspects of Energy Management and Energy Audit", 4th edition, Bureau of Energy Efficiency, New Delhi, India, 2015
2. "Energy Efficiency in Electrical Utilities", 4th edition, Bureau of Energy Efficiency, New Delhi, 2015.
3. "Energy Efficiency in Thermal Utilities", 4th edition, Bureau of Energy Efficiency, New Delhi, 2015.

REFERENCES:

1. Albert Thumann, William J. Younger, "Handbook of Energy Audits", 9th Edition, Taylor & Francis Group, 2013
2. Rajiv Shankar, "Energy Auditing in Electrical Utilities", Viva Books, 2014
3. K V Sharma and P Venkataseshaiah, "Energy Management and Conservation", 1st edition, International Publishing House pvt.ltd,2011.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		**Assessment II (100 Marks)**		**Total Internal Assessments**	**End Semester Examinations**
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	**60**	**40**	**60**	**200**	**100**
Total				**40**	**60**
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER VI

		Category: OEC				
U21ITX05	SOCIAL MEDIA SECURITY	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Introduction to online social network and its impact on society
- Understanding various threats, challenges and privacy issues in online social network
- Make use of threat handling tools for solving real – world issues

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Infer the basic concepts, categories and impact of online social networks on users (Understand)

CO2: Understanding the various threats on online social networks and appropriate solutions against them (Understand)

CO3: Demonstrate the social authority in social platform (Apply)

CO4: Make use of machine learning and deep learning to detect OSN attacks (Apply)

CO5: Utilizing various threat handling tools for solving real-world threats (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	1	-	-	2	-	-	-	-		
CO2	1	-	-	-	1	1	-	2	-	-	-	-		
CO3	3	1	-	-	2	1	-	2	-	-	-	1		
CO4	3	1	-	-	2	2	-	2	-	-	-	1		
CO5	2	1	-	-	2	2	-	2	-	-	-	1		
Correlation levels:			1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)			

SYLLABUS

UNIT I ONLINE SOCIAL MEDIA AND THEIR IMPACT ON USERS 9

Online social media Vulnerabilities – Functional parameters – Interaction among service providers and its users – Background and motivation – Statistical analysis – Categories of online social media – Rapid growth of Social network environment – Usage of online social media based on requirement – Online social media issues and impact – Difficulties in detection and mitigation of various attacks against OSNs

UNIT II SECURITY CHALLENGES IN SOCIAL NETWORKS 9

Dark side of online social media and media - Opportunities - Taxonomy of online social media based attacks - Advanced persistent threats - Classical threats - Social threats - Taxonomy of

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various solutions against online social media attacks - In-built security solution - Third party software solutions - Other security attacks

UNIT III FUNDAMENTALS OF ONLINE SOCIAL MEDIA S AND OPPORTUNITIES 9

Opportunities in social media – Branding - Building of social authority in social platform - Customers engagement - Consumer brand related activity – Hashtag - Mistake in replying to users of social network - Collective intelligence.

UNIT IV MACHINE LEARNING AND DEEP LEARNING BASED SECURITY SOLUTIONS 9

Introduction - Problem definition - Proposed approach for fake account detection - Characteristics analysis of Twitter accounts - Selection of features and computing feature sets - Construction of raw dataset and the creation of a labeled dataset from raw data - Petri-net based analyzer - Simulation of Petri Net in PN2 environment - Verification using SPIN model checker - Evaluation of result and performance analysis

UNIT V THREAT HANDLING TOOLS 9

Social media platforms - Categories of social media attacks based on account types - Categories of online social media attacks - Cyber security tools for protecting user account and information - Tips to protect system, account, information - Open issues and challenges in existing security solutions - Principles to protect the user account on a social platform

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOK:

1. Brij B. Gupta, Somya Ranjan Sahoo, "Online Social Networks Security: Principles, Algorithm, Applications, and Perspectives", 1st Edition, Knowledge works global ltd, Oxon, 2021

REFERENCES:

1. Borko Furht, Handbook of Social Network Technologies and Applications,1st Edition, Springer, 2010
2. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", 1st Edition, Springer, 2011
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER VI

U21ITX06	ENTERPRISE RESOURCE PLANNING	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- NIL

COURSE OBJECTIVES:

- To offer a current and forward-looking analysis of the theory and application of enterprise resource planning technology
- To develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth
- Aspire to equip them with higher technical skills so they can upgrade themselves

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Employ enterprise software in its most basic capacities and consider how it helps to integrate business functions (Understand)

CO2: Show an in-depth understanding of the fundamental issues associated with ERP systems (Understand)

CO3: Design the ERP implementation strategies (Apply)

CO4: Analyse the strategic options for ERP identification and adoption (Analyze)

CO5: Comprehend the necessity of Business Systems and Processes through a strategic analysis of ERP systems (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	2	-	1	1	-	1	-		
CO2	2	-	-	-	-	2	-	1	2	-	1	-		
CO3	2	-	-	1	-	2	-	1	2	1	2	2		
CO4	2	3	-	2	-	2	-	1	2	1	2	2		
CO5	2	-	-	1	-	2	-	1	1	-	2	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)				3: Substantial (High)						

SYLLABUS:

UNIT I INTRODUCTION 9

Introduction – Related technologies – Business intelligence – E-Commerce and E-Business – Business process reengineering – Data warehousing – Data mining – Online analytical processing (OLAP) – Product life cycle management – Supply chain management – Customer relationship management.

UNIT II ERP INTRODUCTION 9

Implementation challenges – Strategies – Life cycle – Pre-implementation tasks –Requirements

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definition – Methodologies – Package selection – Project teams – Process definitions – Vendors and consultants – Data migration – Project management – Post implementation activities.

UNIT III ERP IN ACTION AND BUSINESS MODELS 9

Operation and maintenance – Performance – Maximizing the ERP system – Business modules – Finance – Manufacturing – Human resources – Plant maintenance – Materials management – Quality management – Marketing – Sales, distribution and service.

UNIT IV ERP MARKET 9

Marketplace – Dynamics – SAP AG – Oracle – PeopleSoft – JD Edwards – QAD Inc – SSA Global – Lawson software – Epicor – Intutive.

UNIT V ENTERPRISE APPLICATION INTEGRATION 9

Enterprise application integration – ERP and E-Business – ERP II – Total quality management – Future directions – Trends in ERP.

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total: 45 Periods

TEXT BOOKS:

1. Gerardus Blokdyk, "Enterprise Resource Planning A Complete Guide", The Art of Service, 1st Edition, 2021
2. Steven Scott Phillips , "Control Your ERP Destiny: Reduce Project Costs, Mitigate Risks, and Design Better Business Solutions",3rd edition, Amazon, 2019

REFERENCES:

1. Jose Antonio Fernandez, The SAP R/3 Handbook, 2nd Edition, Tata McGraw Hill, 2015.
2. Michael W. Pelphrey ,Directing the ERP Implementation (Resource Management),1st Edition, CRC Press, 2015.
3. Ashim Raj Singla , "Enterprise Resource Planning", 2nd Edition, Cengage India Private Limited, 2016.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF MECHANICAL ENGINEERING

SEMESTER VI

U21MEX05	AUTOMOTIVE SYSTEMS	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the auxiliary systems of an automotive engine, and types of frames and steering systems
- To learn the different types of transmission, suspension and braking systems
- To study about various alternative sources of energy in SI and CI engines

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Identify the different types of engines, injection and ignition systems (Understand)

CO2: Use the knowledge on various types of chassis, frames and steering systems (Understand)

CO3: Recognize various transmission systems and its components (Understand)

CO4: Identify different suspension, braking systems, and distribution of forces (Understand)

CO5: Discuss appropriate alternative sources of energy in SI and CI engines (Understand)

CO–PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	-	-	-	-	-	-	-	1		
CO2	3	1	1	-	-	-	-	-	-	-	-	1		
CO3	3	1	1	-	-	-	-	-	-	-	-	1		
CO4	3	1	1	-	-	-	-	-	-	-	-	1		
CO5	3	2	2	-	-	-	-	-	-	-	-	2		
Correlation levels: 1:Slight (Low) 2:Moderate (Medium) 3:Substantial (High)														

SYLLABUS:

UNIT I AUTOMOTIVE ENGINE AUXILIARY SYSTEMS 9

Automotive engines – External & Internal combustion engines – Classification of engines – SI Engines – CI Engines – Two stroke engines – Four stroke engines – Construction and working principles – IC engine components – Functions and materials – Valve timing – port timing diagram – Injection system – Unit injector system – Rotary distributor type – Electronically controlled injection system for SI engines – CI engines. Ignition system – Electronic ignition system – Transistorized ignition system – Capacitive discharge ignition system

UNIT II VEHICLE FRAMES AND STEERING SYSTEM3 9

Vehicle construction and different chassis layouts – Classifications of chassis – Types of frames – Frameless chassis construction – Articulated vehicles – Vehicle body – Vehicle aerodynamics – various resistances and its effects – Steering system – Conventional – Sophisticated vehicle – Types of steering gear box – Power steering – Steering geometry – Condition for true rolling motion

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– Ackermann's – Devis steering system – Types of stub axle – Types of rear axles

UNIT III TRANSMISSION SYSTEMS 9

Clutch – Types and construction – Gear boxes – Manual and automatic – Gear shift mechanisms – over drive – Transfer box – Fluid flywheel – Torque converter – Propeller shaft – Slip joints – Universal joints – Hotchkiss drive and Torque Tube Drive – Rear axle differential – Wheels and tyres

UNIT IV SUSPENSION AND BRAKES SYSTEM 9

Suspension Systems – Conventional suspension systems – Independent suspension systems – Leaf spring – Coil spring – Taper – Lite – Eligo's spring – Types of brakes – Pneumatic and hydraulic braking systems – Antilock Braking System (ABS) – Electronic brake force distribution (EBD) and traction control – Equation of Forces acting while applying a brake on plain surface – inclined road – Gradient

UNIT V ALTERNATIVE ENERGY SOURCES 9

Natural gas – Liquefied petroleum gas – Bio – Diesel – Bio – Ethanol – Gasohol and hydrogen in automobiles – Engine modifications required – Performance – Combustion and emission characteristics of SI and CI engines with these alternate fuels – Electric and hybrid vehicles – Fuel cell – Turbo chargers – Engine emission control by three – Way catalytic converter system

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project : – Periods

Total :45 Periods

TEXT BOOKS:

1. Ganesan V. Internal Combustion Engines, 4th edition, McGraw Hill, Europe, 2017
2. Jain K.K. and Asthana R.B., Automobile Engineering, 4th edition, Tata McGraw Hill Publishers, New Delhi, 2017

REFERENCES:

1. Kirpal Singh, Automobile Engineering, Vol 1 and 2, 7th edition, Standard Publishers, New Delhi, 2014
2. Ramalingam K. K. Automobile Engineering, 1st edition, Scitech Publications (India) Pvt Ltd, Chennai, 2017
3. Gill P. S. A Textbook of Automobile Engineering, Vol I, II and III, 5th edition, S.K. Kataria & Sons, New Delhi 2012

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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SEMESTER VI

		Category: OEC				
U21MEX06	LOW COST AUTOMATION	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To provide basic knowledge about automation
- To explain the application of hydraulic and pneumatic systems for automation
- To explain the various methods and devices used in assembly automation

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Explain the methods and levels of automation (Understand)

CO2: Develop simple hydraulic circuits and apply them in implementing automated systems (Understand)

CO3: Develop simple pneumatics circuits and apply them in implementing automated systems (Understand)

CO4: Apply the principles and methods of assembly automation (Apply)

CO5: Select the various part feeding systems and configurations of automated assembly systems and apply them in implementing automation (Understand)

CO - PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-		
CO2	3	-	-	-	-	-	-	-	-	-	-	-		
CO3	3	-	-	-	-	-	-	-	-	-	-	-		
CO4	3	-	-	-	-	-	-	-	-	-	-	-		
CO5	3	2	-	-	-	-	-	-	-	-	-	-		

Correlation levels: 1:Slight (Low) 2:Moderate (Medium) 3:Substantial (High)

SYLLABUS:

UNIT I INTRODUCTION TO AUTOMATION **9**

Concept of automation – Mechanization and automation – Concept of automation in industry automation – Classification Automation in production systems – Principles and strategies – Elements, functions – Product / production relationships – Manufacturing economics – Automated systems – Elements – Functions – Levels

UNIT II AUTOMATION USING HYDRAULIC SYSTEMS **9**

Design aspects of various elements of hydraulic systems such as pumps – Valves, filters, reservoirs, accumulators, actuators, and intensifiers etc., Selection of hydraulic fluid – Design simple hydraulic circuits like Regenerative circuit, Automatic cylinder reciprocation circuit, two hand safety control circuit and hydraulic circuit for arm extension of a robot;servo valves, electro hydraulic valves, proportional valves and their applications

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UNIT III AUTOMATION USING PNEUMATIC SYSTEMS 9

Pneumatics fundamentals – Control elements, position and pressure sensing, logic circuits switching circuits – Sequential circuits – Cascade methods, KV mapping – Pneumatic equipments – Selection of components – Design calculations; Application – Hydro pneumatic circuits, vibration bowl feeder

UNIT IV AUTOMATION USING ELECTRONIC SYSTEMS 9

Introduction – Various sensors – Transducers – Signal processing – Servo systems – Programming of microprocessors using 8085 instructions; programmable logic controllers (PLC); Use of microprocessors for sequencing – Low cost PLC based robotic circuits

UNIT V ASSEMBLY AUTOMATION 9

Types and configurations – Parts delivery at workstations – Automation devices – Hopper feeders, rotary disc feeder, centrifugal and orientation – Product designs for automated assembly, balancing of assembly line using available algorithms – Transfer line – Monitoring system (TLMS) using line status – Line efficiency – Buffer stock simulation in assembly line

Contact Periods:

Lecture: 45 Periods Tutorial: - Periods Practical: – Periods Project : – Periods

Total : 45 Periods

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with applications", 1st edition, Prentice Hall international, 2013
2. Mikell P Groover, "Automation, Production System and Computer Integrated Manufacturing", 1st edition, Prentice Hall Publications, 2015

REFERENCES:

1. Srinivasan R, "Hydraulic and Pneumatic Controls", 1st edition, McGraw Hill Education (India) Pvt Ltd, 2008
2. Kuo. B.C, "Automatic control systems", 1st edition, Prentice Hall India, New Delhi, 2014
3. Majumdar.S.R, "Pneumatic System", 1st edition, Tata McGraw Hill, 2006
4. Peter Rohner, "Industrial hydraulic control", 1st edition, Wiley Edition, 2005

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		**Assessment II (100 Marks)**		**Total Internal Assessments**	**End Semester Examinations**
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	**60**	**40**	**60**	**200**	**100**
Total				**40**	**60**
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF MECHATRONICS ENGINEERING

SEMESTER VI

		Category: OEC				
		L	T	P	J	C
U21MIX05	PRODUCT DESIGN AND DEVELOPMENT	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn about product development methods based on current innovative trends.
- To understand the requirements of customers and product planning process.
- To learn the product specifications and concept generation screening and testing.
- To know the product architecture, industrial design considerations and prototyping.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Infer the basic need for new product design and development process (Understand)
CO2: Identify opportunities and customer needs for new product development (Apply)
CO3: Arrive at product specification and develop concepts for new product (Apply)
CO4: Establish the overall product architecture and assess its industrial design (Apply)
CO5: Assess the design from environmental, manufacturing and supply chain perspective and develop prototypes (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	1	1	-	-	-	3		
CO2	3	3	3	2	2	2	1	1	-	-	-	3		
CO3	3	3	3	2	2	2	1	1	-	-	-	3		
CO4	3	3	3	2	2	2	1	1	-	-	-	3		
CO5	3	3	3	2	2	2	1	1	-	-	-	3		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I DEVELOPMENT PROCESSES AND ORGANIZATIONS 9

Introduction to new product and product design - Characteristics of successful product development - The challenges in product development - Product development process - Adapting generic product development process - Product development process flows -Product development organizations

UNIT II OPPORTUNITY IDENTIFICATION AND PRODUCT PLANNING 9

Types of opportunities - Structure of Opportunity Identification - Opportunity identification process; Product Planning Process - Four types of product development projects - Steps in Product Planning - Identifying Customer needs

UNIT III PRODUCT SPECIFICATIONS AND CONCEPT GENERATION 9

Product Specifications - Target and final specifications Concept generation: Five step method - Concept selection - Concept screening - Concept scoring - Concept testing

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UNIT IV PRODUCT ARCHITECTURE AND INDUSTRIAL DESIGN 9

Implications of the architecture - Establishing the architecture - Delayed differentiation - Platform Planning - System level design issues Industrial Design - Assessing the Need for Industrial Design and its impact - Industrial design process and management - Assessing the quality of Industrial Design

UNIT V DESIGN CONSIDERATIONS AND PROTOTYPING 9

Design for environment - Design for manufacturing and supply chain; Prototyping - Principles - Technologies - Planning for prototypes - Robust design – Process flow

Contact Periods:

Lecture: 45 Periods Tutorial: _ Periods Practical: – Periods Project – Periods

Total 45 Periods

TEXTBOOKS:

1. Ulrich, Karl T, Eppinger, Steve D, and Yang, Maria C, "Product Design and Development", 7th Edition, McGraw-Hill Education, 2020
2. Devdas Shetty, "Product Design for Engineers", Cengage Learning, Boston, 2016

REFERENCES:

1. Maddock M and Uriarte L, "Brand New: Solving the Innovation Paradox – How Great Brands Invent and Launch New Products, Services and Business Models", John Wiley & Sons, Inc, New Jersey, 2011
2. Steven W Trimble and Abdelrahman N Shuaib, "Product Design and Development Handbook", Cognella, United States, 2022

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		**Assessment II (100 Marks)**		**Total Internal Assessments**	**End Semester Examinations**
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	**60**	**40**	**60**	**200**	**100**
Total				**40**	**60**
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose any one / two components based on the nature of the course.

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DEPARTMENT OF MECHATRONICS ENGINEERING

SEMESTER VI

		Category: OEC				
		L	T	P	J	C
U21MIX06	INTRODUCTION TO INDUSTRIAL INTERNET OF THINGS	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn about the modify of existing industrial systems with IoT concepts
- To understand the importance of IIoT architecture, sensors and interfacing units
- To learn the protocols required for industrial data transmission
- To know the IIoT application domains in various industries with AR and VR technologies

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Comprehend the fundamentals of IIoT and its potential, challenges (Understand)
CO2: Infer the various components and architecture of IIoT (Understand)
CO3: Design the sensors based IIoT architecture with interface standards (Apply)
CO4: Realize and choose the Protocols and Cloud platforms for different IIoT solutions (Apply)
CO5: Build the concepts of Design Thinking for industrial applications (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	3	-	-	-	-	-	-	1		
CO2	3	2	2	2	3	-	-	-	-	-	-	1		
CO3	3	2	2	2	3	-	-	-	-	-	-	1		
CO4	3	2	2	2	3	-	-	-	-	-	-	1		
CO5	3	2	2	2	3	-	-	-	-	-	-	1		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I INTRODUCTION 9

Introduction - IoT Architecture – Application-based IoT Protocols – Infrastructure-based protocols - Data protocols -Transport protocols Cloud Computing: Types of cloud - Business aspects of cloud – Virtualization - Key aspect of cloud computing - Mobile cloud computing - Fog Computing: Applications of Fog computing Sensor Cloud: Applications of Sensor Cloud - Big Data

UNIT II IIOT ARCHITECTURES 9

Overview of IoT components - Various architectures of IoT and IIoT, Advantages and disadvantages, Industrial internet - Reference architecture; IIoT system components: Sensors, Gateways, Routers, Modem, Cloud brokers, servers, and its integration, WSN, WSN network design for IoT

UNIT III SENSOR AND INTERFACING 9

Introduction to Sensors, Transducers, Classifications - Roles of sensors in IoT - Various types of sensors - Design of sensors: sensor architecture, special requirements for IIoT sensors - Role of

actuators - Types of actuators - Hardwire the sensors with different protocols such as HART, MODBUS - Serial and Parallel, Ethernet, BACNet and M2M

UNIT IV PROTOCOLS AND CLOUD 9

Introduction to Industrial data transmission, Features & Components: Fieldbus, Profibus, HART, Interbus, Bitbus, CC-link, Modbus, Batibus, DigitalSTROM, Controller area network, DeviceNet, LonWorks, ISA 10011a, Wireless HART, LoRa & LoRaWAN, NB-IoT, IEEE 80211AH Clouds : Types of clouds

UNIT V INDUSTRIAL IOT- APPLICATION DOMAINS 9

Healthcare, Power plants - Inventory management and quality control - Plant safety and security (Including AR and VR safety applications), Facility management - Oil - Chemical and pharmaceutical industry - Applications of UAVs in Industries

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total 45 Periods

TEXTBOOKS:

1. Anandarup Mukherjee, Chandana Roy, Sudip Misra," Introduction to Industrial Internet of Things and Industry 40", 1st Edition, CRC Press, 2020
2. Alasdair Gilchrist, "Industry 40: The Industrial Internet of Things", 1st Edition, Apress, New York, 2017

REFERENCES:

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", John Wiley& Sons publications, United Kingdom, 2013
2. Olivier Hersent, David Boswarthic &, Omar Elloumi, "The Internet of Things: Key Applications and Protocols", 2nd Edition, Wiley publication, New Jersey, 2012

EVALUATION PATTERN:

<table>
<tr><th colspan="4">Continuous Internal Assessments</th><th rowspan="3">Total Internal Assessments</th><th rowspan="3">End Semester Examinations</th></tr>
<tr><th colspan="2">Assessment I (100 Marks)</th><th colspan="2">Assessment II (100 Marks)</th></tr>
<tr><td>*Individual Assignment / Case Study / Seminar / Project / MCQ</td><td>Written Test</td><td>*Individual Assignment / Case Study / Seminar / Project / MCQ</td><td>Written Test</td></tr>
<tr><td>40</td><td>60</td><td>40</td><td>60</td><td>200</td><td>100</td></tr>
<tr><td colspan="4" rowspan="2">Total</td><td>40</td><td>60</td></tr>
<tr><td colspan="2">100</td></tr>
</table>

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided Course coordinator can choose any one / two components based on the nature of the course

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DEPARTMENT OF MECHATRONICS ENGINEERING

SEMESTER VI

		Category: OEC				
		L	T	P	J	C
U21MIX07	GRAPHICAL SYSTEM DESIGN USING LabVIEW	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn the fundamentals of graphical programming techniques with instrument interfaces
- To understand the data acquisition in real time systems
- To learn the various software and hardware tools for testing, measurement and control
- To know the signal processing and analysis tool for industrial applications

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Demonstrate the basic concepts of Virtual Instrumentation (Understand)
CO2: Interpret the software tools in Virtual Instrumentation using GSD platform (Apply)
CO3: Develop programming concepts in graphical programming environment (Apply)
CO4: Interface data acquisition hardware with software tools (Apply)
CO5: Develop programming concepts with advanced software tools (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	-	2		
CO2	3	3	3	3	2	-	-	-	-	-	-	2		
CO3	3	3	3	3	2	-	-	-	-	-	-	2		
CO4	3	3	3	3	2	-	-	-	-	-	-	2		
CO5	3	3	3	3	2	-	-	-	-	-	-	2		
Correlation levels:			1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)			

SYLLABUS:

UNIT I INTRODUCTION TO GSD 9

Historical perspectives and architecture of a virtual instrument, Graphical System Design (GSD) - G programming/ modular programming - Controls and Indicators - Data flow programming using Numeric, String, Boolean functions - Data types - Editing, Debugging and Running a Virtual Instrument

UNIT II GSD PROGRAMMING TECHNIQUES 9

Graphical programming palettes and tools, Function and Libraries in GSD platform - String and File I/O: High level and Low-level file I/O's to Read / Write a file - Sub-VI programming, Structures: FOR Loops, WHILE loops, Shift Registers and CASE structures

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UNIT III GSD SOFTWARE TOOLS 9

Arrays and Clusters - Bundle/Unbundle and Bundle/Unbundle - Plotting data: waveform graphs and charts - Attribute nodes - Local and global variables - Formula nodes, Sequence structures and Timed looped structures

UNIT IV GSD DATA ACQUISITION HARDWARE 9

Basics of DAQ hardware and software - concepts of data acquisition - Configuring and addressing the hardware - Real time data acquisition using Hardware: USB based DAQ with programming - Seven-Segment LED Display/ Motor/ Buzzer/ Speaker

UNIT V SIGNAL PROCESSING AND CONTROL 9

Signal Processing and Analysis tool: Fourier transform, Power spectrum Analysis Communication protocol: TCP IP Client server Control Design and Simulation tool: Build basic transfer function for open and closed loop system with PID controller

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project: – Periods

Total 45 Periods

TEXTBOOKS:

1. Jeffery Travis and Jim Kring, "LabVIEW for Everyone: Graphical programming made easy and Fun", 3rd Edition, Pearson Education, India, 2009
2. Jovitha Jeroma, "Virtual Instruments using LabView", PHI Learning Pvt Ltd, New Delhi, 2010

REFERENCES:

1. Gary W Jonson and Richard Jennings "Labview Graphical Programming", 4th Edition, McGraw Hill, New York, 2017
2. Gupta, Joseph and John, "Virtual Instrumentation using LabVIEW", 2nd Edition, Tata McGraw Hill, 2010

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course coordinator can choose any one / two components based on the nature of the course.

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Open Elective

Semester VI

U21MAX02	LINEAR PROGRAMMING PROBLEMS (Common to all)	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic concepts of resource management techniques
- To solve problems in linear programming and Integer programming
- To familiar with CPM and PERT

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Solve optimization problems using simplex method (Understand)

CO2: Solve transportation and assignment problems (Understand)

CO3: Apply integer programming and linear programming to solve real-life applications (Apply)

CO4: Use mathematical software to solve the proposed models (Understand)

CO5: Use PERT and CPM for problems in project management (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	1	-	-	-	-	-	-	1		
CO2	2	2	1	-	1	-	-	-	-	-	-	1		
CO3	2	1	1	-	1	-	-	-	-	-	-	1		
CO4	3	2	1	-	1	-	-	-	-	-	-	1		
CO5	3	3	1	-	1	-	-	-	-	-	-	1		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

SYLLABUS:

UNIT I LINEAR PROGRAMMING 9

Principal components of decision problem – Modeling phases – LP formulation and graphic solution – Resource allocation problems – Simplex method – Sensitivity analysis

UNIT II DUALITY AND NETWORKS 9

Definition of dual problem – Primal – Dual relationships – Dual simplex methods – Post optimality analysis – Transportation and assignment model - Shortest route problem

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UNIT III INTEGER PROGRAMMING 9

Cutting plan algorithm – Branch and bound methods, multistage (dynamic) programming

UNIT IV CLASSICAL OPTIMIZATION THEORY 9

Unconstrained external problems, Newton Ralphson method – Equality constraints – Jacobean methods – Lagrangian method – Kuhn – Tucker conditions – Simple problems

UNIT V OBJECT SCHEDULING 9

Network diagram representation – Critical path method – Time charts and resource levelling – PERT

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 45 Periods

TEXT BOOKS:

1. Taha H A, "Operation Research", 10th edition, Pearson Education, 2019.
2. Grewal B A, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2017.

REFERENCES:

1. Paneer Selvam, "Operations Research", 2nd edition, Pearson Education, 2016.
2. Anderson, "Quantitative Methods for Business", 8th edition, Thomson Learning, 2002.
3. Winston, "Operation Research", 4th edition, Brooks, 2003.
4. Vohra, "Quantitative Techniques in Management", 5th edition, Tata Mc Graw Hill, 2017.

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

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DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

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(Autonomous, NAAC "A")

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