KPR Institute of Engineering and Technology

Learn Beyond (Autonomous, NAAC "A")

Avinashi Road, Arasur, Coimbatore.

Great Place To Work. Certified MAR 2022 - MAR 2023 INDIA

IV Semester – Open Electives Syllabi

B.E. / B.Tech. Programme

Regulations – 2021(Revised)

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REGULATIONS – 2021 (Revised)

B.E. / B.Tech. Programme

IV SEMESTER – OPEN ELECTIVES

SYLLABI

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21ADX01	Data Visualization and its applications
2	U21ADX02	Fundamentals of Machine Learning
DEPARTMENT OF BIOMEDICAL ENGINEERING		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21BMX01	Virtual Instrumentation
2	U21BMX02	Biometric Systems
DEPARTMENT OF CHEMICAL ENGINEERING		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21CHX01	Introduction to Food Processing
2	U21CHX02	Energy Conservation Techniques in Process Industries
DEPARTMENT OF CIVIL ENGINEERING		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21CEX01	Environmental & Social Impact Assessment
2	U21CEX02	Integrated Water Resource Management
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21CSX01	Database Systems
2	U21CSX02	Cloud Computing Essentials
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21AMX01	Big Data and its Applications
DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21CBX01	Digital Marketing
2	U21CBX02	Web Designing

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21ECX01	Consumer Electronics
2	U21ECX02	Basics of Communication Technologies
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21EEX01	Electrical Safety Practices and Standards
2	U21EEX02	Electric Vehicles
DEPARTMENT OF INFORMATION TECHNOLOGY		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21ITX01	Information Technology Essentials
2	U21ITX02	Introduction to Cyber Security
DEPARTMENT OF MECHANICAL ENGINEERING		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21MEX01	Industrial Robotics
2	U21MEX02	Intelligent Vehicle System
DEPARTMENT OF MECHATRONICS ENGINEERING		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21MIX01	Design of Mechatronics Systems
2	U21MIX02	Modern Robotics
DEPARTMENT OF SCIENCE & HUMANITIES		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21CYX01	Air Pollution and Control
2	U21PHX01	Basics of Nanotechnology and its Applications
GENERAL ENGINEERING		
SL. NO.	**COURSE CODE**	**COURSE TITLE**
1	U21GEX01	Indian Culture, Ethics and Yoga
2	U21GEX02	Vedic Mathematics

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEMESTER IV

		Category: OEC				
U21ADX01	DATA VISUALIZATION AND ITS APPLICATIONS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the various types of data, apply and evaluate the principles of data visualization.
- To learn how to bring valuable insight from the massive dataset using visualization.
- To create interactive visualization for better insight using various visualization tools.

COURSE OUTCOMES:

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

CO1: Identify the different data types, visualization types to bring out the insight. (Understand)

CO2: Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on large dataset. (Understand)

CO3: Design visualization dashboard to support the decision making on large scale data. (Apply)

CO4: Demonstrate the analysis of large dataset using various visualization techniques and tools. (Apply)

CO5: Identify the different attributes and showcasing them in plots. Identify and create various visualizations for geospatial and table data. (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION TO DATA VISUALIZATION 9

Overview of data visualization – Data Abstraction – Task Abstraction – Analysis: Four Levels for Validation – Types of Visual Analysis: Time-Series data visualization – Text data visualization – Multivariate data visualization

UNIT II VISUALIZATION TECHNIQUES 9

Scalar and Point techniques – Color maps – Contouring – Height Plots – Vector visualization techniques – Vector properties – Vector Glyphs – Vector Color Coding – Matrix visualization

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techniques – Visual Variables- Networks and Trees – Map Color and Other Channels – Manipulate View – HeatMap

UNIT III VISUALIZATION TOOLS 9

Introduction to various data visualization tools: R-basics, Data preprocessing – Statistical analysis – Plotly and ggplot library – Tableau – D3.js – Gephi

UNIT IV VISUALIZATION OF STREAMING DATA 9

Best practices of Data Streaming – Processing streaming data for visualization – Presenting streaming data – Streaming visualization techniques – Streaming analysis

UNIT V GEO SPATIAL VISUALIZATION 9

Chloropleth map – Hexagonal Binning – Dot map – Cluster map – Cartogram map – Dashboard creation using visualization tools for the use cases: Finance – marketing – insurance – healthcare

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Tamara Munzer, Visualization Analysis and Design, 1st edition, CRC Press 2014.
2. Aragues, Anthony, Visualizing Streaming Data: Interactive Analysis Beyond Static Limits, 1st edition, O'Reilly Media, Inc., 2018.

REFERENCES:

1. Dr.Chun-hauh Chen, W.K.Hardle, A.Unwin, Handbook of Data Visualization, 1st edition, Springer publication, 2016.
2. Christian Toninski, Heidrun Schumann, Interactive Visual Data Analysis, 1st edition, CRC press publication, 2020
3. Alexandru C. Telea, Data Visualization: Principles and Practice, AK Peters, 2014.
4. https://www.coursera.org/specializations/data-visualization
5. https://www.coursera.org/specializations/jhu-data-visualization-dashboarding-with-r
6. https://www.coursera.org/specializations/data-analysis-visualization-foundations
7. https://www.springer.com/journal/12650

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 ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEMESTER IV

		Category: OEC				
U21ADX02	FUNDAMENTALS OF MACHINE LEARNING	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concept of supervised and unsupervised learning techniques.
- To differentiate regression, classification and clustering techniques and to implement their algorithms.
- To analyze the performance of various machine learning techniques and to select appropriate features for training machine learning algorithms.

COURSE OUTCOMES:

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

CO1: Understand the concepts of various machine learning strategies. (Understand)

CO2: Handle computational data and learn ANN learning models. (Understand)

CO3: Solve real world applications by selecting suitable learning model. (Analyze)

CO4: Boost the performance of the model by combining results from different approaches. (Understand)

CO5: Recognize and classify sequencing patterns using HMM. (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION TO MACHINE LEARNING 9

Introduction to Machine Learning (ML) – Feature engineering – Learning Paradigm – Generalization of hypothesis – VC Dimension – PAC learning – Applications of ML.

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UNIT II DATA HANDLING AND ANN 9

Feature selection Mechanisms – Imbalanced data – Outlier detection – Artificial neural networks including back-propagation – Applications.

UNIT III ML MODELS AND EVALUATION 9

Regression: Multi-variable regression – Model evaluation – Least squares regression – Regularization – LASSO – Applications of regression – Classification – KNN, Naïve Bayes, SVM, Decision Tree – Training and testing classifier models – Cross-validation – Model evaluation (precision, recall, F1-mesure, accuracy, area under curve); Statistical decision theory including discriminant functions and decision surfaces.

UNIT IV MODEL ASSESSMENT AND INFERENCE 9

Model assessment and Selection – Ensemble Learning – Boosting – Bagging – Model Inference and Averaging – Bayesian Theory – EM Algorithm.

UNIT V HIDDEN MARKOV MODELS & CLUSTERING 9

Hidden Markov Models (HMM) with forward-backward and Vierbi algorithms – Sequence classification using HMM – Conditional random fields – Applications of sequence classification such as part-of-speech tagging – K Means, Hierarchical Clustering – Minimum spanning tree clustering.

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, 3rd Edition, Pearson, 2014.
2. Friedman Jerome, Trevor Hastie, and Robert Tibshirani. The Elements of Statistical Learning, 2nd Edition, Springer-Verlag, 2013

REFERENCES:

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", 1st edition, MIT Press, 2012.
2. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", 1st edition, Cambridge University Press, 2012.
3. https://in.coursera.org/learn/fundamental-machine-learning-healthcare.
4. https://in.coursera.org/learn/machine-learning.

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 BIOMEDICAL ENGINEERING

SEMESTER IV

		Category: OEC				
U21BMX01	VIRTUAL INSTRUMENTATION	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn computer-based interface system
- To practice LabVIEW programming environment
- To develop applications using virtual instrumentation technique

COURSE OUTCOMES:

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

CO1: Illustrate the fundamentals of Virtual Instrumentation (Understand)

CO2: Develop LabVIEW programming (Apply)

CO3: Apply the LabVIEW programming for report generation (Apply)

CO4: Take part in data acquisition with real-time application (Analyze)

CO5: Make use of virtual instrument for various biomedical applications (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION TO VIRTUAL INSTRUMENTATION 9

Historical perspective and traditional bench top instruments – Advantages of virtual instrument, – Block diagram of virtual instrument – Physical quantities and analog interfaces – User Interfaces – Architecture of a virtual instrument – Relation to the operating system

UNIT II LABVIEW PROGRAMMING 9

Front panel – Block diagram, Tools, Control and Function palette – Modular programming —VI and sub VI – Structures – FOR-WHILE loops – Case, Sequence Structures, Event structures –Formula nodes – Local and global variables

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UNIT III ARRAYS, CLUSTERS AND REPORT GENERATION 9

Arrays – Clusters – String and File – High level and Low level file I/O – Time and Dialog control – Waveform – Graph – Chart operations – String functions – Report generation and publishing measurement data in web

UNIT IV DATA ACQUISITION SYSTEM 9

Instrument control – GPIB – VISA – Instrument drivers – Serial port communication – Data Acquisition review: Review of Transducer and Signal conditioning – DAQ hardware – AI-AO –DI/O – DAQ assistant and configurations

UNIT V APPLICATIONS OF VIRTUAL INSTRUMENTATION 9

Networking basics for office and industrial applications – Development of process database management system – Simulation of system using VI – Image acquisition and processing –Motion control

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Jeffery Travis and Jim kring, "LabVIEW for Everyone: Graphical Programming Made Easy and Fun", 3rd Edition, Pearson Education, India, 2009
2. Sanjay Gupta, Joseph, "Virtual Instrumentation using LabVIEW", 2nd Edition, Tata McGraw Hill, 2010
3. Jovitha Jerome, "Virtual Instruments using LabView", 1st editionby PHI Learning Private Limited, New Delhi, 2010

REFERENCES:

1. Bruce mihure, Austin and Texas, "LabVIEW for data acquisition", 1st Edition, Prentice Hall of India, New Delhi, 2001
2. LabVIEW Basics I and II Manual, 1st Edition, National Instruments, India, 2013
3. Barry E. Paton, "Sensor, Transducers and LabVIEW", 1st Edition, Prentice Hall of India, New Delhi, 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		
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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 IV

		Category: OEC				
U21BMX02	BIOMETRIC SYSTEMS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To illustrate the principles and performance of biometric system
- To recognize personal privacy and security implications of biometric technology
- To identify the issues in the realistic evaluation of biometric based system

COURSE OUTCOMES:

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

CO1: Explain the basics of biometrics and data analysis (Understand)

CO2: Demonstrate engineering principles in fingerprint and face recognition technology Understand)

CO3: Illustrate the engineering principles in iris, hand geometry recognition technology (Apply)

CO4: Interpret the engineering principles in voice recognition technology and Foot recognition technology (Apply)

CO5: Analyze the fusion of biometrics (Analyze)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION TO BIOMETRIC SYSTEMS 9

Introduction - Biometric system. Biometric functionalities - Verification vs Identification –Biometric system errors– Performance measures, Design cycle of Biometric systems - Biometric characteristics – Applications – Security and Privacy issues

UNIT II FINGERPRINT AND FACE RECOGNITION 9

Introduction – Friction Ridge Pattern - Fingerprint acquisition – Feature extraction – Matching, Introduction to face recognition – Image acquisition – Face Detection – Feature extraction and Matching – Face Super-Resolution using locality preserving projections

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UNIT III IRIS AND HAND GEOMETRY RECOGNITION 9

Iris recognition system – Image acquisition – Iris segmentation – Iris Normalization – Iris Matching – Performance Evaluation – Hand Geometry – Image capture - Hand segmentation – Feature Extraction and matching - Challenges

UNIT IV VOICE AND FOOT GEOMETRY RECOGNITIONS 9

Introduction to Voice recognition – Features and Models – Addition method for managing variability – Measuring performance – Alternative approaches – Voice scan Strength and weakness - Foot Geometry –Gait analysis – Feature extraction and Matching - Challenges

UNIT V FUSION IN BIOMETRICS 9

Introduction to Multimodal system – Sources of Multiple Evidence – Acquisition and Processing – Fusion levels – sensor level – feature level – decision making level – rank level - score level – Advantages in designing Multimodal system - Challenges in designing Multibiometrics – Case study

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Arun.A.Ross, Karthik Nandhakumar, Jain A.K, "Introduction to Biometrics", 1st Edition, Springer, New York, 2011
2. James Wayman, Anil Jain, Davide Maltoni, Dario Maio, "Biometric systems, Technology, Design and Performance Evaluation", 1st Edition, Springer, 2005

REFERENCES:

1. David D. Zhang, "Automated Biometrics: Technologies and Systems", 1st Kluwer Academic Publishers, New Delhi, 2000
2. Ted Dunstone, Neil yager, "Biometric system and Data analysis: Design, Evaluation and DataMining", 1st Springer, 2010

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		
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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 IV

		Category: OEC				
U21CHX01	INTRODUCTION TO FOOD PROCESSING	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To impart the knowledge about the mechanism of spoilage and deterioration in foods
- To provide the basic knowledge on food preservation principles and methods
- To show the ways to preserve the foods

COURSE OUTCOMES:

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

CO1: Identify the food spoilage occurs and the techniques to prevent it (Understand)

CO2: Relate the different spoilage agents and the ways in which they act on food (Apply)

CO3: Understand the principles behind the various methods of food preservation (Understand)

CO4: Use these principles to preserve different types of foods (Apply)

CO5: Understand the method of action of different preservatives (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I FOOD SPOILAGE 9

Definition, types of spoilage - physical, enzymatic, chemical and biological spoilage. Mechanism of spoilage and its end products, shelf life determination

UNIT II PRESERVATION BY USING PRESERVATIVES 9

Food preservation: Definition, principles, importance of food preservation, traditional and modern methods of food preservation. Food additives – definition, types, Class land Class II preservatives

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UNIT III PRESERVATION BY USE OF HIGH TEMPERATURE 9

Pasteurization: Definition, types, Sterilization, Canning - history and steps involved, spoilage encountered in canned foods, types of containers used for canning foods. Food irradiation – Principles, merits and demerits, effects of irradiation and photochemical methods

UNIT IV PRESERVATION BY USE OF LOW TEMPERATURE 9

Refrigeration - Advantages and disadvantages, freezing - types of freezing, Common spoilages, occurring during freezing, difference between refrigeration and freezing

UNIT V PRESERVATION BY REMOVAL OF MOISTURE 9

Drying and dehydration - merits and demerits, factors affecting, different types of drying, Concentration: principles and types of concentrated foods

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Gould, G. W. "New Methods of food preservation", 1st Edition, Springer Science & Business Media, 2012.
2. Manay, N.S. Shadaksharaswamy, M. "Foods- Facts and Principles", 1st Edition, New age international publishers, New Delhi, 2004.

REFERENCES:

1. Srilakshmi, B. "Food Science", 3rd Edition, New Age International Publishers, New Delhi, 2003.
2. Subalakshmi, G and Udipi, S.A. "Food processing and preservation", 3rd Edition, New Delhi, 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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SEMESTER IV

		Category: OEC				
U21CHX02	ENERGY CONSERVATION IN PROCESS INDUSTRIES	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To provide training to solve problems relevant to the energy conservation
- Describe the energy conservation schemes in steam systems
- Identify the design considerations for minimizing energy consumption in compressors, fans and blowers

COURSE OUTCOMES:

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

CO1: Understand the current energy scenario and the need for energy auditing (Understand)

CO2: Identify the design considerations for minimizing energy consumption in compressors, fans and blowers (Understand)

CO3: Compare different renewable energy technologies and choose the most appropriate based on local conditions and technological basis for harnessing renewable energy sources (Apply)

CO4: List the techno commercial statement for the investment for energy saving (Analyze)

CO5: Convert energy conservation in process industries (Apply)

CO-PO MAPPING:

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

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

SYLLABUS

UNIT I INTRODUCTION 9

Introduction to energy – Global energy scene – Indian energy scene - Units of energy, conversion factors, general classification of energy, energy crisis, energy alternatives

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Professor & Head
Department of Chemical Engineering
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UNIT II ENERGY CONSERVATION IN PRODUCTIVE PROCESSES 9

Energy Conservation in Centrifugal pumps, Fans, Blowers and Air compressor - Energy Consumption - Energy saving potentials - Design Consideration

UNIT III ENERGY CONSERVATION IN NON - PRODUCTIVE PROCESSES 9

Refrigeration and Air conditioning - Heat load estimation - Energy conservation in cooling towers and Spray ponds - Energy Efficiency in Lighting - Case studies

UNIT IV NATURAL SOURCES 9

Solar energy, solar thermal systems, flat plate collectors, focusing collectors, solar water heating, solar cooling, solar distillation, solar refrigeration, solar dryers, solar pond, solar thermal power generation, solar energy application in India, energy plantations. Wind energy, types of windmills, types of wind rotors, Darrieus rotor and Gravian rotor, wind electric power generation, wind power in India, economics of wind farm, ocean wave energy conversion, ocean thermal energy conversion, tidal energy conversion, geothermal energy

UNIT V ENERGY CONSERVATION IN CHEMICAL PLANTS 9

Energy conservation in chemical process plants, energy audit, energy saving in heat exchangers, distillation columns, dryers, ovens and furnaces and boilers, steam economy in chemical plants, energy conservation

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Eastop T.D and Croft D.R, "Energy Efficiency for Engineers and Technologists", 1st Edition, Logman Scientific & Technical publications, 1990
2. Reay D.A, "Industrial Energy Conservation", 1st Edition, Pergamon Press, 1977.

REFERENCES:

1. Venkataswarlu, D., "Chemical Technology", 2nd Edition, I.S.Chand, 2010.
2. Sukhatme, S.P., "Solar Energy", 4th Edition, Tata McGraw Hill, 2008.
3. H.M. Robert, J.H. Collins, " Handbook of Energy Conservation-Volume 1", 2nd Edition, CBS Publishers & Distributors, 2005.

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.

SEMESTER IV

		Category: OEC				
U21CEX01	ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To impart the knowledge and skills to identify the environmental and social impacts of developmental projects
- To gain the knowledge in assessing and mitigate the environmental and social impacts of developmental projects
- To explain the various components for preparing the EIA document

COURSE OUTCOMES:

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

CO1: Illustrate the principles of EIA (Understand)

CO2: Infer the scope and screening of EIA developmental projects (Understand)

CO3: Plan environmental impact assessments and environmental management plans (Understand)

CO4: Evaluate Socio-economic reports of environmental impacts (Understand)

CO5: Outline the reports of EIA studies (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION 9

Impacts of development on environment – Rio Principles of sustainable development – Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle – EIA Notification and Legal Framework.

UNIT II ENVIRONMENTAL ASSESSMENT 9

Screening and scoping in EIA – Drafting of terms of reference, Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna – Matrices – Networks – Checklist

Methods – Mathematical models for Impact prediction.

UNIT III ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Public Hearing – Environmental Clearance.

UNIT IV SOCIO ECONOMIC ASSESSMENT 9

Baseline monitoring of Socio-economic environment – Identification of project affected personal – Rehabilitation and resettlement plan – Economic valuation of environmental impacts – Cost benefit analysis.

UNIT V CASE STUDIES 9

EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems – Airports – Dams and Irrigation projects – Power plants.

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Canter, R.L, "Environmental Impact Assessment ",McGraw Hill Inc, 2nd Edition, New Delhi,1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank, 1st Edition,1997.
3. Peter Morris, Riki Therivel "Methods of Environmental Impact Assessment", Routledge Publishers, 2nd Edition, 2009.

REFERENCES:

1. Becker H. A., Frank Vanclay,"The International handbook of social impact assessment" conceptual and methodological advances, Edward Elgar Publishing, 3rd Edition, 2003.
2. Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme, 2nd Edition, 2002.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", 1st edition, Blackwell Science New York, 1998.
4. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

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KPRIET

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.

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SEMESTER IV

		Category: OEC				
U21CEX02	INTEGRATED WATER RESOURCE MANAGEMENT	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To impart the knowledge in the role of disciplines of ecology and socio-economics play in management of water resources
- To gain the knowledge in the global food security and public-private participation issues
- To explain the legal and regulatory settings in the context of integrated water resource management

COURSE OUTCOME:

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

CO1: Identify the key challenges and needs of integrated water resource management (Understand)

CO2: Explain the economic aspects of water issues (Understand)

CO3: Interpret the health protection and promotion in the context (Understand)

CO4: Find suitable water for food protection (Understand)

CO5: Formulate regulations of integrated water management system (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I CONTEXT FOR IWRM 9

Water as a global issue: key challenges and needs – Definition of IWRM within the broader context of development – Complexity of the IWRM process – Examining the key elements of IWRM process.

UNIT II WATER ECONOMICS 9

Economic view of water issues: economic characteristics of water good and services – Non-market monetary valuation methods – Water economic instruments, policy options for water conservation and sustainable use – Case studies.

UNIT III WATER SUPPLY AND HEALTH WITHIN THE IWRM CONSIDERATION 9

Links between water and human health: options to include water management interventions for health – Health protection and promotion in the context of IWRM – Health impact assessment of water resources development.

UNIT IV AGRICULTURE IN THE CONCEPT OF IWRM 9

Baseline monitoring of Socio-economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental Impacts – Cost benefit Analysis.

UNIT V WATER LEGAL AND REGULATORY SETTINGS 9

Basic notion of law and governance: principles of international and national law in the area of water management – Understanding UN law on non-navigable uses of international water courses – Development of IWRM in line with legal and regulatory framework.

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Technical Advisory Committee, Integrated Water Resources management, Technical Advisory Committee Background Paper No: 4. Global water partnership, Stockholm, Sweden. 2002.
2. Technical Advisory Committee, Poverty Reduction and IWRM, Technical Advisory Committee Background paper no: 8. Global water partnership, Stockholm, Sweden, 2003.
3. Technical Advisory Committee, Regulation and Private Participation in Water and Sanitation section, Technical Advisory Committee Background paper No:1. Global water partnership, Stockholm, Sweden, 1998.

REFERENCES:

1. Technical Advisory Committee, Dublin principles for water as reflected in comparative assessment of institutional and legal arrangements for Integrated Water Resources Management, Technical Advisory Committee Background paper No: 3. Global water partnership, Stockholm, Sweden. 1999.
2. Technical Advisory Committee, Water as social and economic good: How to put the principles to practice". Technical Advisory Committee Background paper No: 2. Global water partnership, Stockholm, Sweden, 1998.
3. Technical Advisory Committee, Effective Water Governance "Technical Advisory Committee Background paper No: 7. Global water partnership, Stockholm, Sweden, 2003. Cech Thomas V., Principles of water resources: history, development, management and policy. John Wiley and Sons Inc., New York. 2003.
4. Mollinga.P. et.al "Integrated Water Resources Management", Water in South Asia Volume I, Sage Publications, 2nd Edition, 2006.

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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.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER IV

		Category: OEC				
U21CSX01	DATABASE SYSTEMS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn the fundamentals of data models, SQL
- To represent a database system using ER diagrams and to learn normalization techniques
- To understand the fundamental concepts of transaction, concurrency and recovery processing

COURSE OUTCOMES:

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

CO1: Explain the fundamentals of Database Management Systems (Understand)

CO2: Analyze the data requirements and apply ER modeling, derive the database schema using conceptual modeling (Analyze)

CO3: Query the relational database and write the programs (Understand)

CO4: Construct queries to handle transaction processing and maintain consistency of the database (Apply)

CO5: Understand how advanced database differ from relational database and the concepts of information retrieval systems (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I DATABASE SYSTEMS **9**

Data – Purpose of Database System – Need for Database Management – Database Applications – Data Models – Database System Architecture – Introduction to Relational Database – Relational Model– Keys

UNIT II DATABASE DESIGN 9

ER Models – ER Diagrams – Enhanced-ER Model – ER-to-relational Mapping – Dependencies– Normalization – First – Second – Third & Fourth Normal Forms – BCNF – Join Dependencies

UNIT III DATABASE QUERYING 9

SQL : Fundamentals – DDL – Specifying integrity constraints –DML – Basic retrieval queries in SQL – Nested queries – Correlated subqueries – Joins – Aggregated functions – Views – Procedure – Function – Triggers

UNIT IV TRANSACTION AND CONCURRENCY 9

Introduction to Transactions – ACID properties – Schedules – Serializability – Need for Concurrency – Concurrency control – Two phase Locking – Timestamp. Deadlock Handling – Recovery concepts – Recovery based on deferred and immediate update – Shadow paging

UNIT V ADVANCED TOPICS 9

NOSQL Databases: Introduction – CAP Theorem – Document Based Systems – Key value Stores – Column Based Systems – Information Retrieval: IR Concepts – Retrieval Models – Queries in IR systems.

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 7th Edition, McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2017

REFERENCES:

1. Raghu Ramakrishnan, —Database Management Systemsll, 4th Edition, McGraw-Hill College Publications, 2015
2. G.K.Gupta, "database Mangement Systems", 1st Edition, Tata Mc Graw Hill, 2011
3. C.J.Date,A.Kannan and S.Swamynathan,"An Introduction to database systems", 8th Edition, Pearson Education,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 IV

		Category: OEC				
U21CSX02	CLOUD COMPUTING ESSENTIALS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the architecture and features of different cloud models
- To acquire basic knowledge on virtualization, cloud applications and cloud storage
- To learn security issues and cloud computing platforms

COURSE OUTCOMES:

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

CO1: Describe the different types of cloud models and services for building an efficient cloud computing environment (Understand)

CO2: Analyze the virtualization technologies to create shared resource pools (Analyze)

CO3: Interpret the best features to move to the cloud and categorize the cloud storage types (Understand)

CO4: Explore the cloud security concerns (Analyze)

CO5: Analyze the available cloud software and computing platforms (Analyze)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I CLOUD COMPUTING BASICS 9

Introduction to Cloud Computing – Evolution of Cloud Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning – NIST Cloud Computing Reference Architecture – Architectural Design Challenges – Deployment Models – Service Models – Benefits of Cloud Computing

UNIT II VIRTUALIZATION 9

Introduction to Virtual Machines – Emulation: Interpretation and Binary Translation – Process Virtual Machines and System Virtualization – Need of virtualization-limitations – Types of Hardware Virtualization: Full Virtualization – Para Virtualization– Case Studies: Xen – VMware – Desktop Virtualization

UNIT III CLOUD STORAGE AND APPLICATIONS 9

Cloud Storage– Provisioning Cloud Storage – Storage as a Service – Advantages of Cloud Storage – Cloud Storage Providers – Amazon S3 – Migrating Applications to the Cloud – Applications in the Cloud – Functionality Mapping – Application – Attributes – Cloud Service Attributes – System Abstraction

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter cloud resource management – Resource provisioning and resource provisioning methods – Global exchange of cloud resources – Security Overview – Cloud Security Challenges – Security Governance – Virtual Machine Security – IAM – Security Standards

UNIT V CLOUD TECHNOLOGY ADVANCEMENTS 9

Serverless Cloud – Multi–Cloud and Joint Cloud Provider – Automated Cloud Orchestration – Optimization – Hadoop – Map Reduce – Google App Engine – Open Stack – Introduction to Containers - Kubernetes – Heroku and Docker Containers – Kubernetes

Contact Periods:

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

TEXT BOOKS:

1. Dac-Nhuong Le, Raghvendra Kumar, Gia Nhu Nguyen, Jyotir Moy Chatterjee, "Cloud Computing and Virtualizaton", 2nd Edition, Wiley Publishers, 2018
2. Nick, Gillam, Lee, "Cloud Computing – Principles, Systems and Applications", 2nd Edition, Springer, 2017

REFERENCES:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", 1st Edition, Tata Mcgraw Hill, 2013
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach", 1st Edition, Tata Mcgraw Hill, 2009
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", 1st Edition, O'Reilly, 2009
4. Barrie Sosinsky, "Cloud Computing Bible", 1st Edition, Wiley Publishing, 2015

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Learn Beyond

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 MACHINE LEARNING

SEMESTER IV

		Category: OEC				
U21AMX01	BIG DATA AND ITS APPLICATIONS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the big data platform and its use cases.
- To provide an overview of data analytics and visualization.
- To apply Hadoop and MapReduce for various applications.

COURSE OUTCOMES:

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

CO1: Describe big data and use cases from selected business domains. (Understand)

CO2: Articulate the overview of data analytics and visualization. (Understand)

CO3: Install, Configure, and Run Hadoop in any kind of Bigdata platform. (Apply)

CO4: Perform MapReduce analytics for an application. (Apply)

CO5: Develop Big Data Solutions for different applications. (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION TO BIG DATA 9

Types of Digital Data – Introduction to Big Data and Big Data Analytics – Best Practices for Big data Analytics – Characteristics of Big data – Big Data Use Cases – Understanding Big Data Storage – Features of Big Data – Evolution of Big data

UNIT II DATA ANALYTICS AND VISUALIZATION 9

Predictive Analytics – Simple linear regression – Multiple linear regression – Classification – Clustering - Association. Visualizations – Visual data analysis techniques – Interaction techniques – Systems and applications. Case Studies: social media data analysis

UNIT III HADOOP ENVIRONMENT 9

Design of HDFS - Components of Hadoop - HDFS Concepts - Command Line Interface - Hadoop file system interfaces - Analyzing the Data with Hadoop - Data flow - Data Ingest with Flume and Scoop and Hadoop archives - Hadoop I/O: Compression, Serialization, Avro and File-Based

UNIT IV MAP REDUCE 9

Map Reduce concepts - Anatomy of a Map Reduce Job Run – Failures - Job Scheduling - Shuffle and Sort - Task Execution - Map Reduce Types and Formats - Map Reduce Features – Resource Management: Resource Allocation, YARN Scheduler- Developing a Simple Map Reduce Application: Word Count

UNIT V APPLICATIONS OF BIG DATA 9

Applications of Big Data: Healthcare - Media and Entertainment – Education – IoT – Manufacturing – Government

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", 2nd Edition, Wiley Publications, 2019
2. Tom White "Hadoop: The Definitive Guide" 3rd Edition, Oreily Media, 2012

REFERENCES:

1. Kim H. Pries, Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers", 1st Edition Auerbach Pubn, 2022
2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", 1st Edition, Wiley publishers, 2015

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	

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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

SEMESTER IV

		Category: OEC				
U21CBX01	DIGITAL MARKETING	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To explore the digital marketing methods
- To learn Search Engine Optimization and Google Adwords
- To study the Google analytics for business development

COURSE OUTCOMES:

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

CO1: Explain the latest digital marketing trends (Understand)

CO2: Describe the optimization techniques of search engine (Understand)

CO3: Apply the Google Adwords marketing strategies for business growth (Apply)

CO4: Perform various social media marketing for business (Apply)

CO5: Identify the target audience through google analytics (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I BASICS OF DIGITAL MARKETING 9

Introduction to Digital Marketing, Importance of Digital Marketing, Traditional Marketing vs Digital Marketing, Types of Digital Marketing, Market Research, Keyword Research and Analysis, Types of keywords, Localized keyword Research, Competitor website keyword Analysis

UNIT II SEARCH ENGINE OPTIMIZATION 9

Introduction to Search Engine Optimization, SEO fundamentals, and concepts, on-page optimization, off-page optimization, SEO tools for website analysis and optimization, Competitor Website Analysis

R. Devi

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UNIT III GOOGLE ADWORDS MARKETTING 9

Introduction to Online Advertising and Adwords, Basics of Adwords, Account and Campaign, Adwords Targeting and Bidding, Adwords Tools, Ads Type, Bidding Strategies, Shopping Ads, Video Ads

UNIT IV SOCIAL MEDIA OPTIMIZATION AND MARKETING 9

Introduction to Social Media Networks, Types of Social Media websites, Social Media Optimization concepts, Facebook Page creation for business, Facebook Analytics, Facebook Advertising, and its types, Creating Advertising Campaigns, Twitter Page creation, Conversion and HashTags, LinkedIn Profile Creation, Branding on LinkedIn, Google Plus-Tools and Techniques, Google Plus for business

UNIT V GOOGLE WEB ANALYTICS 9

Introduction to Google Analytics, Navigating Google Analytics, Real-Time Monitoring, Audience, Traffic source, Behaviour, Content, Visitors, Live Data, Integration of Google Analytics on Website, Analysis, and Report Generation

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Ryan Deiss and Russ Henneberry, "Digital Marketing For Dummies", 1st edition, Wiley, 2020
2. Todd Kelsey, "Introduction to Search Engine Optimization", 1st edition, Apress, 2017

REFERENCES:

1. Dave Chaffey and Fiona Ellis-Chadwick, "Digital Marketing Strategy, Implementation & Practice", 2nd Edition, Pearson, 2019
2. Alan Charlesworth, "Absolute Essentials of Digital Marketing", 2nd edition, Taylor & Francis, 2020
3. Jeremy Jacob, "Search Engine Optimization Complete Guide", 2nd edition, CreateSpace Independent Publishing Platform, 2017

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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SEMESTER IV

		Category: OEC				
U21CBX02	WEB DESIGNING	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn basic concepts of HTML, CSS, and Javascript
- To design website using WordPress and Webflow tools
- To gain practical insights of website hosting

COURSE OUTCOMES:

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

CO1: Summarize the basics concepts of HTML and the attributes (Understand)

CO2: Apply the concepts of CSS and its various style sheets (Apply)

CO3: Express the features and basic concepts of Javascript (Understand)

CO4: Design websites using simple web design tools (Apply)

CO5: Deploy the website on local and cloud server (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION TO HTML 9

Introduction to HTML, Structure of HTML Document, HTML Tags: Attributes, meta elements, Linking document, Lists, Tables, Forms, Form Elements, Form Attributes Lists, Frames, Graphics to HTML Document

UNIT II CASCADING STYLE SHEETS 9

Introduction to CSS, Inline Styles, Conflicting Styles, Style Sheets, Formatting text, Colours and Background, Padding, Borders, and Margins, Floating and positioning, Text Flow, Media Types, Drop-Down Menu, Page Layout with CSS, Transition, Transforms and Animation

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UNIT III JAVASCRIPT 9

Introduction to Javascript, Advantage of Javascript, Javascript Syntax, Datatype, Variable, Array, Operator and Expression, Looping Constructor, Function, Dialog box, Events

UNIT IV WEB DESIGN TOOLS 9

Basics of WordPress, Installing WordPress, Installing a template and customizing the website design, Creating pages in WordPress, Customizing WordPress with addons and extensions, Webflow, CMS and Editor, Creation of webflow account, Installing pre-built template, Creation of Navbar, Drag and Drop of components

UNIT V WEBSITE HOSTING 9

Web Hosting Basics, Website Hosting Services, Types of Hosting Plans, Selection of domains, Defining Name Servers, Deployment of Website: Local Host, Cloud, Maintaining a Website

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Jennifer Robbins "Learning Web Design", 5th Edition, O'Reilly Media, Inc., 2018
2. Julie C. Meloni and Jennifer Kyrnin " HTML, CSS, and JavaScript All in One", 3rd Edition, Pearson Education, 2018

REFERENCES:

1. Ben Frain "Responsive Web Design with HTML5 and CSS", 4th Edition, Packt Publishing, 2022
2. John Dean "Web Programming with HTML5, CSS, and JavaScript", 1st Edition,Jones & Bartlett Learning, 2018

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 IV

		Category: OEC				
		L	T	P	J	C
U21ECX01	CONSUMER ELECTRONICS	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To study the basics of audio technology
- To understand the telecommunication systems
- To learn the working principles of consumer electronic appliances

COURSE OUTCOMES:

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

CO1: Explain the fundamentals of audio devices (Understand)
CO2: Describe the working concepts of audio systems (Understand)
CO3: Compute the performance of television systems (Apply)
CO4: Summarize various techniques in automotive electronics (Understand)
CO5: Illustrate the operation of various consumer home appliances (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I FUNDAMENTAL OF AUDIO DEVICES 9

Basic characteristics of acoustics – Mono and stereo audio amplifiers – Microphone and loudspeakers – Working principle – Characteristics and types – Optical recording

UNIT II AUDIO SYSTEMS 9

Stereo multiplexing – Equalizers and mixers – Electronic music synthesizers – Public address systems and characteristics – Theatre sound reproduction systems – Hi-Fi system

UNIT III TELEVISION STANDARDS AND SYSTEMS 9

Elements of a television – Scanning process, aspect ratio, interlacing of scanning lines – Vidicon camera tube – Monochrome picture tube – Color TV standards – NTPC,PAL,SECAM – Satellite and cable television – DTH receiver – Flat panel display – HDTV – 3D TV

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UNIT IV AUTOMOTIVE ELECTRONICS 9

Electronic ignitron – Electronic meters – Antilock braking system – Electronic controlled suspension – Automotive steering system – Air bag system – Car navigation system – Telematics control unit

UNIT V CONSUMER APPLIANCES 9

Microwave ovens – Washing machines – Mobile phones – Digital clocks – Air conditioners – Refrigerators – Dishwashers – Set-top boxes

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Gulati R.R, "Modern Television Practice: Transmission, Reception and Applications", 4th edition, New Age International (P) Ltd, New Delhi, 2012
2. Balli S.P, "Consumer Electronics", 2nd edition, Pearson Education, New Delhi, 2009

REFERENCES:

1. Gupta B.R, "Consumer Electronics", 6th edition, S.K.Kataria and Sons, New Delhi, 2013
2. Gupta R.G, "Audio and Video Systems: Principles, Maintenance and Troubleshooting", 5th edition, Mc-Graw Hill, New Delhi, 2010
3. Dhake A.M, "Television and Video Engineering", 4th edition, Mc-Graw Hill Education, New Delhi, 2006
4. Balli R.P, "Colour Television, Theory and Practice", 2nd edition, Mc-Graw Hill Education, New Delhi, 2004

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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SEMESTER IV

		Category: OEC				
U21ECX02	BASICS OF COMMUNICATION TECHNOLOGIES	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn the fundamentals of various Analog and digital modulations
- To understand the various modern wireless communication systems
- To study about multi-user radio communication.

COURSE OUTCOMES:

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

CO1: Illustrate the different types of Communication system (Understand)

CO2: Classify types wireless communication techniques (Understand)

CO3: Apply the appropriate pulse modulation technique for space communication (Apply)

CO4: Compare the performance of Wi-Fi and WI-MAX systems (Analyze)

CO5: Explain the multi user radio communication for mobile communication (Understand)

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	1	-	-	-	-	-	-	2	-	-	2		
CO3	3	2	2	-	-	-	-	-	2	-	-	2		
CO4	3	3	2	-	-	-	-	-	2	-	-	2		
CO5	2	-	-	-	-	-	-	-	2	-	-	2		
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SYLLABUS:

UNIT I PRINCIPLES OF COMMUNICATION 9

Structure of communication – Simplex, half duplex and full duplex communication – Serial and parallel communication – Modulation and demodulation techniques – Amplitude modulation – Frequency modulation – Time division multiplexing – Frequency division multiplexing

UNIT II WIRELESS COMMUNICATION SYSTEMS 9

Second generation (2G) cellular networks – Third generation (3G) wireless networks – Fourth generation (4G) wireless networks – Wireless personal area networks, Bluetooth and Zig-Bee – Radio frequency identification (RFID)

UNIT III INTRODUCTION TO DIGITAL COMMUNICATION 9

Introduction to digital communication systems – Sampling process – Aliasing – Sampling theorem for band limited signals – Pulse amplitude modulation – Pulse width modulation

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UNIT IV WI-FI AND WI-MAX TECHNOLOGIES 9

Introduction to Wi-Fi and Wi-MAX – Principles and parameters for wireless LAN (IEEE 802.11 standards) – Operating principles for Wi-MAX (IEEE 802.16 standard) – Comparison of Wi-Fi and Wi-MAX

UNIT V MULTI-USER RADIO COMMUNICATION 9

Introduction to 5G communication – Global system for mobile communications – Cellular concept and frequency reuse – Channel assignment and handover techniques – Overview of multiple access schemes

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. B. P. Lathi, " Modern Digital And Analog Communication Systems:", Oxford University Press, 4th Edition, 2017
2. Louis E. Frenzel, "Principles of Electronic Communication Systems", 3rd edition, Tata McGraw Hill, 2012

REFERENCES:

1. Saad Z. Asif, "5G Mobile Communications Concepts and Technologies, CRC Press, 1st edition, 2019
2. Theodore S. Rappaport, "Wireless Communications-Principles and Practice", 2nd edition, PHI, 2010
3. B. Sklar, "Digital Communication Fundamentals and Applications", 2nd edition, Pearson Education, 2009
4. Jeffrey G. Andrews, Arunabha Ghosh, Rias Muhamed, "Fundamentals of WiMAX: Understanding Broadband Wireless Networking", 1st Edition, Prentice Hall, 2007

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 ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER IV

		Category: OEC				
U21EEX01	ELECTRICAL SAFETY PRACTICES AND STANDARDS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge on electrical safety, hazards and its components
- To understand the concepts of grounding and earthing practices
- To apply the safety practices and various standards for electrical safety

COURSE OUTCOMES:

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

CO1: Explain the fundamentals of safety and hazards of electricity (Understand)

CO2: Summarize the various types of electrical safety equipments (Understand)

CO3: Infer the general requirements of grounding and earthing practices (Understand)

CO4: Apply the safety practices in various electrical applications (Apply)

CO5: Explain the various standards for electrical safety (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION TO ELECTRICAL SAFETY 9

Fundamentals of Electrical safety – Electric shock – physiological effects of electric current – Safety requirements – Hazards of electricity – Arc-Blast: Causes for electrical failure

UNIT II SAFETY COMPONENTS 9

Introduction to conductors and insulators – Classification – Safety against over voltages – Safety against static electricity – Electrical safety equipments – Fire extinguishers for electrical safety

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UNIT III GROUNDING 9

General requirements for grounding and bonding – System grounding – Equipment grounding – Earth – Earthing practices – Determining safe approach distance – Determining arc hazard category

UNIT IV SAFETY PRACTICES 9

General first aid – Safety in handling hand held electrical appliances tools – Electrical safety in railway stations – swimming pools, external lighting installations, medical locations

UNIT V STANDARDS FOR ELECTRICAL SAFETY 9

Electricity Acts Rules & regulations – Electrical standards NFPA 70 E - OSHA standards – IEEE standards – National Electric Safety code NESC – Statutory requirements from electrical inspectorate

Contact Periods:

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

TEXT BOOKS:

1. Kenneth G. Mastrullo, Ray A. Jones, "The Electrical Safety Program Book", Jones and Bartlett Publishers, 1st edition, May 2006
2. Palmer Hickman, "Electrical Safety-Related Work Practices", Jones & Bartlett Publishers, 3rd edition, July 2013

REFERENCES:

1. Mohamed A. El - Sharkawi, "Electric Safety: Practice and Standards", 1st edition, CRC Press, 2013
2. Robert J. Alonzo, "Electrical Codes, Standards, Recommended Practices and Regulations; An Examination of Relevant Safety Considerations, William Andrew, 1st edition, December 2009
3. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, Al Winfield, "Electrical Safety Handbook, McGraw Hill Education, 4th edition , March 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 / 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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Learn Beyond

SEMESTER IV

		Category: OEC				
U21EEX02	ELECTRIC VEHICLES	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge on automotive units and electric vehicles
- To understand the working principle of hybrid electric vehicles and electric propulsion system
- To apply the energy management strategies for electric vehicles

COURSE OUTCOMES:

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

CO1: Explain the characteristics and performance of conventional vehicle (Understand)

CO2: Summarize the concept of electric vehicle technology (Understand)

CO3: Infer the operation and control of HEV (Understand)

CO4: Describe the electric propulsion unit in HEV and EV (Understand)

CO5: Interpret the various energy management strategies involved in EV (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	1	-	1	-	-	-	-	-	-	1		
CO3	3	2	1	-	1	-	-	-	-	-	-	1		
CO4	3	2	1	-	-	-	-	-	-	-	-	1		
CO5	3	2	1	-	1	-	-	-	-	-	-	1		

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

SYLLABUS:

UNIT I BASICS OF AUTOMOTIVES 9

Vehicle performance – Vehicle power source characterization – Transmission characteristics – Mathematical models

UNIT II ELECTRIC VEHICLE TECHNOLOGY 9

EV concept – State of art – Configurations – Parameters – Considerations – Electric propulsion system – Engine control unit

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UNIT III HYBRID ELECTRIC VEHICLES 9

Classification of HEVs– Architectures of HEVs – Drive train – Operation pattern – Control strategies – HEV applications for military vehicle

UNIT IV ELECTRIC PROPULSION UNIT 9

Electric components in hybrid and electric vehicles – Configuration and control of DC motor drives, Induction motor drives, Permanent Magnet Motor drives

UNIT V ENERGY MANAGEMENT STRATEGIES 9

Energy management strategies used in hybrid and electric vehicle – Classification – Comparison – Implementation issues of energy strategies

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Iqbal Hussain, "Electric and Hybrid Vehicles-Design Fundamentals", 2nd edition, CRC Press, 2011
2. Mehrdad Ehsani, Yimin Gao and Ali Emadi, "Modern Electric, Hybrid and Fuel Cell Vehicles: Fundamentals", 5th edition, Prentice Hall India, 2010

REFERENCES:

1. Chris Mi, Masrur M A, and Gao D W, "Hybrid Electric Vehicles- Principles and Applications with Practical Perspectives", John Wiley & Sons, 1st edition, June 2011
2. Davide Andrea, "Battery Management Systems for Large Lithium-Ion Battery Packs", Artech House, Unabridged Edition, September 2010
3. Hui Zhang, Dongpu Cao and Haiping Du, "Modeling, Dynamics and Control of Electrified Vehicles", Woodhead Publishing; Illustrated edition, October 2011

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 IV

		Category: OEC				
		L	T	P	J	C
U21ITX01	INFORMATION TECHNOLOGY ESSENTIALS	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce data and data processing cycles
- To explore web and network essentials
- To familiarize with mobile communication and application essentials

COURSE OUTCOMES:

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

CO1: Elucidate data and data processing cycles to infer information (Understand)

CO2: Design and develop web pages and web applications (Apply)

CO3: Describe the layers of network communication (Understand)

CO4: Elaborate mobile communication components and technologies (Understand)

CO5: Develop personal and information retrieval applications (Apply)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION 9

Information Communication Technologies (ICT) – ICT Tools – Data – Direct data and Indirect data – Information – Knowledge – Storing data – Key characteristics of data – Data processing – Data processing activities and cycle – Information Channels

UNIT II WEB ESSENTIALS 9

Internet Basics – Browser Fundamentals – Authoring Tools – Web Server – Database server – HTML – HTML Tags – HTML Forms – Cascading Style Sheets (CSS3) – Scripting Languages – JavaScript

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UNIT III NETWORKING ESSENTIALS 9

Fundamental computer network concepts – Types of computer networks – TCP/IP model – Ethernet – WiFi – Network routing – switching

UNIT IV MOBILE COMMUNICATION ESSENTIALS 9

Cell phone working fundamentals – Cell phone frequencies & channels – Digital cell phone components – Generations of cellular networks – Cell phone network technologies / architecture – Voice calls, Multimeida message and SMS

UNIT V APPLICATION ESSENTIALS 9

Creation of simple interactive applications – Simple database applications – Multimedia applications – Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" 3rd Edition, O'Reilly, 2014
2. James F. Kurose, "Computer Networking: A Top-Down Approach", 6th Edition, Pearson, 2017

REFERENCES:

1. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", 1st Edition, Pearson, 2012
2. R. Kelly Rainer, Casey G. Cegielski , Brad Prince, "Introduction to Information Systems", 5th Edition, Wiley Publication, 2014
3. Kuldeep Singh Kaswan, Om Prakash Sangwan, "Essentials of Information Technology", 1st Edition, Educreation Publishing, 2019

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 IV

		Category: OEC				
U21ITX02	INTRODUCTION TO CYBER SECURITY	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn the notion of cyber security and issues of cyber security
- To familiarize security concepts and malicious code
- To know the cyber laws and information technology act

COURSE OUTCOMES:

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

CO1: Elucidate the notion of cyber security and evolution of cyber security (Understand)

CO2: Exemplify the various cyber security issues (Understand)

CO3: Elaborate the fundamental security algorithms (Understand)

CO4: Infer the impact of malicious code (Understand)

CO5: Identify the cyber laws and information technology act (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION 9

Cyber Security – Cyber Security policy – Domain of Cyber Security Policy: Laws and Regulations, Enterprise Policy, Technology Operations, Technology Configuration - Strategy Versus Policy – Cyber Security Evolution: Productivity, Internet, E-commerce, Counter Measures, Challenges

UNIT II CYBERSECURITY ISSUES 9

Cyber Governance Issues: Net Neutrality, Internet Names, and Numbers, Copyright and Trademarks, Email and Messaging - Cyber User Issues: Malvertising, Impersonation, Appropriate Use, Cyber Crime, Geolocation, Privacy - Cyber Conflict Issues: Intellectual, property Theft, Cyber Espionage, Cyber Sabotage, Cyber Welfare

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UNIT III SECURITY FUNDAMENTALS 9

Information assurance - Basic Cryptography - Symmetric Encryption - Public Key Encryption - DNS Security - Firewalls

UNIT IV MALICIOUS CODE 9

Self-reflecting malicious code - Obfuscation, Virtual Machine Obfuscation - Persistent Software Techniques – Rootkits – Spyware - Stealing Information and Exploitation - Detection and Elevating Privileges - Memory Forensics – Honeypots - Automated Malicious Code Analysis Systems

UNIT V CYBER LAWS AND IT ACTS 9

Cybercrimes – Information Technology ACT - Laws and Ethics, Intellectual property rights - Digital Evidence Controls - Evidence Handling Procedures - Indian Evidence ACT IPC and CrPC - Electronic Communication Privacy ACT - Legal Policies

Contact Periods:

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

TEXT BOOKS:

1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss, "Cyber Security Policy Guidebook", 1st Edition, John Wiley & Sons, 2012
2. James Graham, Rick Howard, Ryan Olson, "Cyber Security Essentials", 1st Edition, CRC Press, 2011

REFERENCES:

1. National Cyber Crime Reference – Handbook-I, National Cyber Safety and Security Standards, India, 2014
2. National Cyber Defence Reference – Handbook, National Cyber Safety and Security Standards, India, 2016

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 MECHANICAL ENGINEERING

SEMESTER IV

		Category: OEC				
		L	T	P	J	C
U21MEX01	INDUSTRIAL ROBOTICS	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce the basic concepts of robots.
- To familiarize students with the various drive systems for robot, sensors and their applications in robots
- To discuss about the various applications of robots, justification and implementation of robot

COURSE OUTCOMES:

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

CO1: Recall the basic concepts, components and types of robots (Understand)

CO2: Construct automatic manufacturing cells with robotic control using the principle behind robotic drive system and end effectors (Understand)

CO3: Apply the concepts of image processing for robotic inspection systems (Apply)

CO4: Outline the various programming methods used in robots (Understand)

CO5: Identify the right Robot for a given industrial application (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION 7

Definition of a Robot – Basic Concepts – Robot configurations – Types of Robots and drives – Basic robot motions – Teach pendant method – Point to point control – Continuous path control

UNIT II COMPONENTS AND OPERATIONS 11

Basic control system concepts – Control system analysis – Robot actuation and feedback – Manipulators – Director and inverse kinematics – Coordinate transformation – Robot dynamics Types of Robot end effectors – Grippers – Tools as end effectors – Robot end effectors interface

1/2/2025

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UNIT III SENSING AND MACHINE VISION 9

Range sensing – Proximity sensing – Touch sensing – Force and Torque sensing – Introduction to Machine vision – Sensing and digitizing – Image processing and analysis

UNIT IV ARTIFICIAL INTELLIGENCE IN ROBOTS 9

Methods – Languages – Capabilities and limitation – Artificial intelligence – search techniques – AI for robotics applications

UNIT V INDUSTRIAL APPLICATIONS 9

Application of robots in machining – Welding – Assembly – Material handling – Loading and unloading – CIM – Hostile and remote environments

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Richard D Klafter, Thomas A Chmielewski and Mickael Negin, "Robotic Engineering – An integrated Approach",3rd edition, Prentice Hall India, New Delhi,2015
2. Mikell P Groover, " Industrial Robotics, and Computer–Integrated Manufacturing", 3rd edition, Pearson Education,2017

REFERENCES:

1. James A Rehg, "Introduction to Robotics in CIM Systems", Prentice Hall of India, 2002
2. Deb S R, "Robotics Technology and Flexible Automation", Tata McGraw Hill, New Delhi, 2014
3. Gupta. A.K, Arora. S. K., "Industrial Automation and Robotics", University Science Press, 2015

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 IV

		Category: OEC				
U21MEX02	INTELLIGENT VEHICLE SYSTEMS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Impart knowledge on the basic concepts of Intelligent Vehicle Systems
- Make the students understand the concept of the connected vehicle and its role in ADAS
- Make the students understand the concept of fully autonomous vehicles

COURSE OUTCOMES:

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

CO1: Explain the fundamental theory of operation in electronic control systems (Understand)

CO2: Evaluate the dependability at system level using wireless technology (Understand)

CO3: Design the connected vehicle and its role in ADAS and automated vehicles (Understand)

CO4: Examine the consistency from proposed autonomous vehicle systems (Understand)

CO5: Develop and implement a successful sensor data fusion as it relates to ADAS (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I FUNDAMENTALS OF INTELLIGENT VEHICLES 9

Introduction to automated – Connected and intelligent vehicles – Automotive electronics – Infotainment – Body – Chassis and Power train electronics – Advanced driver assisted systems – Connected and Autonomous vehicle technology – Basic control system theory – Overview of ECU operation – Concept of cyber – Physical control systems

UNIT II WIRELESS TECHNOLOGY 9

Remote sensing technology – Radar & Sonar – Lidar – Multiple beam – Cameras & Night vision – Model creation & Sensor data fusion, Transmission, Reception, Propagation, Transmission lines and Antennas – Wireless standards – World – Wide standards – Cellular – Wireless networking – Basic networking concepts – Wireless networking fundamentals – Protocols and IP addressing – Connection of on – Board networks to off – Board

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UNIT III CONNECTED CAR TECHNOLOGY 9

Connectivity fundamentals – Navigation and other applications – Vehicle – To – Vehicle – Vehicle – To – Roadside – Wireless security issue – Display technology – Center console technology – Cluster gauge technology – Heads – Up display – Warning / Driver notification technology

UNIT IV AUTONOMOUS VEHICLES 9

Impaired driver technology – Driver impairment problems – Medical – Driver impairment sensors – Transfer of control systems – Monitoring of vehicle systems – Advanced OBD – Basic maintenance functions – End – Of – Life predictions– Driverless vehicle technology – Artificial intelligence and Deep learning – Implementation issues

UNIT V ADAS SYSTEM 9

Major automobile manufacturers – Troubleshooting and maintenance of ADAS Systems – Failure Modes and self – Calibration – Sensor testing and calibration – Redundant systems – Non – Passenger car ADAS and Autonomous operation – ADAS maintenance

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. G. Mullett, Wireless Telecommunications Systems and Networks, Thomson 1st edition, Delmar Learning, ISNB#1–4018–8659–0,2016
2. G. Mullett, Basic Telecommunications: The Physical Layer, Thomson, 1st edition, Delmar Learning, ISBN#1–4018–4339–5,2022

REFERENCES:

1. Fundamentals of intelligent vehicle systems planning by Mashrur A. Chowdhury, Adel Wadid Sadek
2. Lawrence A. Klein, Sensor technologies and Data requirements of ITS
3. ITS Hand Book 2010: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles

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 MECHATRONCIS ENGINEERING

SEMESTER IV

		Category: OEC				
U21MIX01	DESIGN OF MECHATRONICS SYSTEM	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn about Mechatronics system design, simulation, ergonomics, and safety.
- To understand theoretical and practical aspects of system modelling, interfacing, real time data acquisition and control.
- To learn the real time interfacing tools and man-machine interface.
- To know about the various mechatronics systems and its applications.

COURSE OUTCOMES:

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

CO1: Identify the basic elements of mechatronics and its integration concepts (Understand)
CO2: Develop the system models and familiar the Mechatronics design process (Understand)
CO3: Corelate the suitable interface for mechatronics system (Understand)
CO4: Develop the physical systems based on mechatronics design process (Apply)
CO5: Build the mechatronics systems for real time applications (Apply)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I FUNDAMENTALS OF MECHATRONICS SYSTEMS 9

Introduction - Key elements - Mechatronics design process - Types of Design: Traditional and Mechatronics design - Integrated product design - Advanced approaches in Mechatronics Design - Industrial design, modelling and analysis - Ergonomics and Safety.

UNIT II BASIC SYSTEM MODELLING 9

Introduction - Model categories - Fields of application - Model development - Model verification - Model validation - Simulators and Simulation - Design of mixed system: Electromechanical system design - Model transformation - Domain independent description forms: Bond graph and Block Diagram - Simulator coupling.

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UNIT III SYSTEM INTERFACING 9

Introduction - Elements of data acquisition and control system - Overview of I/O process -Installation of I/O card and software - TIA/EIA serial interface standards (RS232/422/485) -General Purpose Interface Bus (IEEE 488) - GUI card - Ethernet switch - Man Machine Interfaces.

UNIT IV CASE STUDY ON MECHATRONICS SYSTEMS 9

Motion control using DC Motor, AC Motor and Servomotor - Internal Combustion Engine with Drive Train - Auto focus Camera - Transducer calibration system - Strain gauge weighing system - Controlling temperature of a hot/cold reservoir using PID.

UNIT V CASE STUDY ON INTELLIGENCE SYSTEMS 9

Machine tool control system - Electronics engine management system - Pick and place industrial manipulator - Autonomous mobile robot - Artificial Intelligence in Mechatronics - Car parking barrier - Fuzzy controlled washing machine.

Contact Periods:

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

Total 45 Periods

TEXTBOOKS:

1. Devdas Shetty & Richard A. Kolk, "Mechatronics System Design", 2nd Edition, CT Cengage Learning, Stamford, 2012.
2. Bolton W., "Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering", 6th Edition, Pearson Education Limited, New York, 2018.

REFERENCES:

1. Robert H. Bishop, "The Mechatronics handbook. Fundamentals and modelling", 2nd Edition, CRC Press, London, 2017.
2. Bradley D, Seward D, Dawson D & Burge S, "Mechatronics and the Design of Intelligent Machines and Systems" 1st Edition, CRC Press, London, 2017.

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	

*Roll 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 MECHATRONICS ENGINEERING

SEMESTER IV

		Category: OEC				
U21MIX02	MODERN ROBOTICS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To Understand the forward kinematics in space frame
- To Derive the Lagrangian equations of motion by hand for simple robot systems
- To Understand the constraints in grasping and robot manipulation

COURSE OUTCOMES:

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

CO1: Use the Modern Robotics code library and the CoppeliaSim robot simulator (Understand)

CO2: Express the joint axes of open-chain robots at the end-effector of the robot (Understand)

CO3: Apply the equation governing the kinetic energy of a robot and a rigid body (Apply)

CO4: Apply the concept of C-space obstacles in the analysis of motion planning (Apply)

CO5: Classify the contact situation between a rigid body and external contacts as a contact mode (Understand)

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	2	-	-	-	-	-	-	1		
CO3	3	2	2	2	2	-	-	-	-	-	-	1		
CO4	3	2	2	2	2	-	-	-	-	-	-	1		
CO5	3	2	2	2	2	-	-	-	-	-	-	1		
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SYLLABUS:

UNIT I FOUNDATIONS OF ROBOT MOTION 9

Introduction to the specialization – Modern Robotics code library – CoppeliaSim robot simulator – light board video-generation tool - Configuration space and degrees of freedom of rigid bodies and robots

24/11/23

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UNIT II ROBOT KINEMATICS 9

Product of exponentials formula for forward kinematics in the space frame – end -effector frame – forward kinematics – screw axis

UNIT III ROBOT DYNAMICS 9

Lagrangian formulation of dynamics – centripetal and Coriolis forces – robot mass matrix – dynamics of a rigid body – Newton-Euler inverse dynamics for an open-chain robot.

UNIT IV ROBOT MOTION PLANNING AND CONTROL 9

Over view of motion planning – C-space obstacles – graphs and trees – A* graph search – path planners – motion planning

UNIT V ROBOT MANIPULATION AND WHEELED MOBILE ROBOTS 9

Kinematics of contact – contact types (rolling, sliding, and breaking) – graphical methods for representing kinematic constraints in the plane – form-closure grasping (complete kinematic constraint).

Contact Periods:

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

Total 45 Periods

TEXTBOOKS:

1. Kevin M. Lynch and Frank C. Park, "Modern Robotics", Cambridge University Press in May 2017, ISBN 9781107156302
2. John J. Craig, "Introduction to Robotics: Mechanics & Control", 3rd edition, McGraw-Hill Education, New Delhi, 2013

REFERENCES:

1. https://www.coursera.org/learn/modernrobotics
2. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, "Robotics Modelling, Planning and Control", Springer, 2013
3. Howie Choset, Seth Hutchinson, Kevin M. Lynch, "Principles of Robot Motion Theory, Algorithms, and Implementations", ISBN 9780262033275

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 be choose any one / two components based on the nature of the course.

24/1/23

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DEPARTMENT OF CHEMISTRY

SEMESTER IV

		Category: OEC				
U21CYX01	AIR POLLUTION AND CONTROL	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- NIL

COURSE OBJECTIVES:

- To acquire knowledge on atmosphere, classification of air pollutants and their effects on environment.
- To understand the principle of control methods of various air pollutants.
- To study automobile air pollutants emission and its control methods.

COURSE OUTCOMES:

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

CO1: Describe the importance of atmosphere and the adverse effects of air pollutants (Understand)

CO2: Discuss the working principle of various types of control equipment for particulate contaminants (Understand)

CO3: Apply the control equipment for pollution prevention in industries (Apply)

CO4: Outline the sources, types and control methods of indoor air pollutants (Understand)

CO5: Explain the formation and control methods of automobile pollutants (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	2	3	-	-	-	-	1	-	-
CO2	3	2	2	-	1	2	3	-	-	-	-	1	-	-
CO3	3	2	2	-	1	2	3	-	-	-	-	1	-	-
CO4	3	2	2	-	1	2	3	-	-	-	-	1	-	-
CO5	3	2	2	-	1	2	3	-	-	-	-	1	-	-
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SYLLABUS:

UNIT I INTRODUCTION 7

Structure and composition of atmosphere – Definition, Scope and Scales of air pollution – Sources and classification of air pollutants and their effect on human health, Vegetation, animals, property, aesthetic value and visibility – Ambient air quality (standards only)

UNIT II CONTROL OF PARTICULATE CONTAMINANTS 11

Factors affecting selection of control equipment – Gas particle interaction – Working principle – Gravity separators, Centrifugal separators, Fabric filters, Particulate scrubbers, Electrostatic precipitators

UNIT III CONTROL OF GASEOUS CONTAMINANTS 11

Factors affecting selection of control equipment – working principle – Absorption, adsorption, condensation, incineration, biofilters – Process control and monitoring (theory only)

UNIT IV INDOOR AIRQUALITY MANAGEMENT 10

Sources, types and control of indoor air pollutants, Sick building syndrome and building related illness – Sources and effects of noise pollution – Measurement standards – Control and preventive measures

UNIT V AIR POLLUTANTS FROM AUTOMOBILES 6

Air pollution due to gasoline driven and diesel driven engines – Formation of CO, HC, NO, effects, direct and indirect control methods

Contact Periods:

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

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", 1st Edition,Tokyo, Springer science media LLC, 2004
2. Noel de Nevers, "Air Pollution Control Engineering",2nd Edition, Waveland press, Inc 2017

REFERENCES:

1. Anjaneyulu. Y, "Air Pollution and Control Technologies",1st Edition, Allied Publishers (P) Ltd., India 2002
2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", 2nd Edition, Academic Press,2006
3. S. Ganeshaguru, "Air Pollution Management",1st Edition, ARS Publications, 2017
4. M.N Rao and HVN Rao, "Air Pollution",2nd Edition, Tata Mcgraw Hill Publishing Company limited, 2007
5. C.S. Rao, "Environmental Pollution Control Engineering", 2nd Edition,New Age International (P) Limited Publishers, 2006

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 PHYSICS

SEMESTER IV

		Category: OEC				
U21PHX01	BASICS OF NANOTECHNOLOGY AND ITS APPLICATIONS	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge of the properties and different classes of nanomaterials
- To gain the knowledge of preparation of nanomaterials
- To acquire the knowledge of the applications of nanotechnology in various fields of engineering and medical field

COURSE OUTCOMES:

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

CO1: Outline the basic ideas of nanomaterials (Understand)

CO2: Illustrate the different classes of nanomaterials (Understand)

CO3: Understand the preparation of nanomaterials (Understand)

CO4: Apply the concept of nanotechnology for electronic applications (Understand)

CO5: Implement the idea of nanotechnology in engineering and medical field (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION TO NANOTECHNOLOGY 9

Definition of nanosystem – Size dependent phenomena – Surface to volume ratio – Fraction of surface atoms and surface energy – Properties (optical, mechanical, electronic and magnetic) – Quantum dots, quantum wells and wires

UNIT II DIFFERENT CLASSES OF NANOMATERIALS 9

Carbon nanotubes – Nanocomposites – Nanoceramics – Biological nanomaterials – Nanomaterials for sustainable construction (Paints, lighting and cooling)

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UNIT III PREPARATION OF NANOMATERIALS 9

Top down and Bottom up approach of building nanomaterials – Electro deposition – Plasma arc discharge – Pulsed laser deposition – Sol-gel method – Ball milling (Demonstration) – Molecular beam epitaxy (MBE) (Industrial visit)

UNIT IV APPLICATIONS OF NANOTECHNOLOGY:NANOELECTRONICS 9

Field effect transistors – Single Electron transistor – OLED, IRLED – Nano electromechanical systems(NEMS) – Coulomb Blockade

UNIT V APPLICATIONS OF NANOTECHNOLOGY:ENGINEERING AND MEDICAL FIELD 9

Hydrogen storage: Nanostructured carbon and nanopolymers – Nanofinishing: Bullet proof vests – Oil and soil repellent, wound dressings, antibacterial and UV resistant – Drug delivery and Cancer therapy (Industrial visit) – Chemical and biosensor – Solar cell

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Pradeep T," A Textbook of Nanoscience and Nanotechnology", 1st Edition, Tata McGraw Hill Education Pvt. Ltd, 2012
2. Guozhong Cao, "Nanostrutures, Nanomaterials, Synthesis, properties and Applications", 2nd Edition, World Scientific series in Nanoscience and Nanotechnology, 2011

REFERENCES:

1. Hanson G W," Fundamentals of Nanoelectronics", 1st Edition, Pearson Education, 2009
2. Bandyopathyay A K, "Nanomaterials", 1st Edition, New Age International Publishers, 2007
3. Mick Wilson, Kannangara Geoff Smith, Michelle Simmons, Burkhard Raguse, "Nanotechnology Basic Science and Emerging Technologies", 1st Edition, CRC Press, Taylor and Francis Group,2002
4. https://nptel.ac.in/courses/113106093

EVALUATION PATTERN:

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

Dr. S. ANANTH
Professor and Head
Department of Physics
Kpr Institute of Engineering and Technology

KPRIET

Centre for Academic Courses

Semester IV

General Engineering

		Category: OEC				
U21GEX01	INDIAN CULTURE, ETHICS AND YOGA	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the Indian culture and philosophy in ancient, medieval and modern period and spread of Indian culture across the globe
- To learn the ethical concepts in Sanskrit and Tamil literature
- To know the history and development of Yoga and Yoga in epics

COURSE OUTCOMES:

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

CO1: Understand Indian culture, religion and philosophy in different periods in India (Understand)

CO2: Understand the spread of Indian culture around the world (Understand)

CO3: Familiarize about ethical concepts in Indian literature (Understand)

CO4: Understanding about origin, history and development of Yoga (Understand)

CO5: Familiarize about Yoga according to various yogic texts (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INDIAN CULTURE: AN INTRODUCTION 9

Indian culture, Significance of Geography on Indian Culture – Society in India through ages – Ancient period, Medieval period, modern period – family and marriage in India, position of women in ancient India – Religion and Philosophy in India: Ancient Period: Pre-Vedic and Vedic Religion, Buddhism and Jainism, Indian philosophy – Vedanthic Philosophy.

UNIT II SPREAD OF INDIAN CULTURE ABROAD 9

Causes, Significance and Modes of Cultural Exchange through Traders and travellers – Indian Culture in South East Asia – Central Asia and Western World through ages

N. Dayal

(Head / OCEAN)

UNIT III REVIEW OF INDIAN ETHICS 9

Ancient ethical texts in Sanskrit: Ramayanam, Mahabharatham, Bhagavat Gita and Arthasasthira – Ancient ethical texts in Tamil: Thirukural and other enlisted texts in Pathinenkeezhkanakku

UNIT IV INTRODUCTION TO YOGA 9

Origin of Yoga: History and Development of Yoga: Vedic period, Medival period, modern era – Psychological aspects and Mythological concepts – Etymology and Definitions of Yoga – Principles of Yoga, Importance of Yoga – Types of Asanas

UNIT V YOGA TEXTS 9

Yoga in Principal Upanishads – Yogic perspective: Ramayana, Mahabharata, Yoga Vasishtha, Bhagavad Gita and Narada Bhakti Sutras – Attanga yogam: Iyamam , Niyamam, Asanam, Pranayamam, Pratyaharam, Tharanam, Dhyanam and Samathi

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Kapil Kapoor and Awadhesh Kumar Singh, "Indian Knowledge Systems: Vol. 1 & 2", D. K. Print World Ltd., 2005.
2. Pandey, G. C., "Foundations of Indian Culture", Vol. 1 & 2, Books & Books, New Delhi, 1984.
3. Singh S. P, "History of Yoga", PHISPC, Centre for Studies in Civilization, 2010.
4. Singh S. P., and Yogi Mukesh, "Foundation of Yoga", Standard Publication, New Delhi, 2010.

REFERENCES:

1. Basham, A. M., "The wonder that was India", Sidgwick & Jackson Publishing Company, 1954.
2. Mukerji, D. P., "Sociology of Indian Culture", Rawat Publications, Jaipur, 1979.
3. Sharma, R.S., "India's ancient past", Oxford publication, 2006.

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	

*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.

N. Dayal's

Head / OCEAN

Semester IV

General Engineering

		Category: OEC				
U21GEX02	**VEDIC MATHEMATICS**	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To know the concepts of Indian mathematics and to learn lessons from History of Srinivasa Ramanujan
- To Identify the mathematical references in vedas and Sulva Sutras
- To rediscover the tradition from the year 1900 and to analyse the development of higher education and scientific research in India

COURSE OUTCOMES:

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

CO1: Understand the proficiency of Indian mathematics through the life history of the genius of Srinivasa Ramanujan (Understand)

CO2: Understand the mathematical references explained in vedas as Sulvasutra, Śulbakara and application of Bodhayana theorem (Understand)

CO3: Understand the application of Aryabhata and Bhaskara using numerical examples (Understand)

CO4: Understanding the concepts of twenty logistics, progressions and plane figures (Understand)

CO5: Familiarize mathematics in modern India comparison with global developments (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INDIAN MATHEMATICS IN WORLD MATHEMATICS 9

An Overview – Proofs in Indian Mathematics – The genius of Srinivasa Ramanujan (1887-1920) – Lessons from History

UNIT II MATHEMATICS IN THE VEDAS AND SULVA SUTRAS 9

Mathematical references in Vedas: The extant Sulvasutra texts and their commentaries – The meaning of the word Sulvasutra – Qualities of a Sulbakara – Finding the cardinal direction – Methods

N. Dr

(Head / OCBAN)

for obtaining perpendicular bisector – Bodhayana's method of constructing a square – The Bodhayana Theorem (so called Pythagoras Theorem) – Applications of Bodhayana Theorem

UNIT III ARYABHATIYA OF ARYABHATA 9

Algorithm for finding the cube root – Formula for the area of a triangle – Bhaskara I on altitude and area of a triangle – Numerical examples: Area of a circle, trapezium and other planar figures – Approximate value of π

UNIT IV BRAHMASPHUTASIDDHĀNTA OF BRAHMAGUPTA 9

Introduction – Twenty logistics – Cube root – Rule of Three, Five Seven, etc – Mixtures, Interest calculations, etc – Progressions: Arithmetic and Geometric – Plane figures: Triangles, right triangles and quadrilaterals – Diagonals of a cyclic quadrilateral

UNIT V MATHEMATICS IN MODERN INDIA 9

Srinivasa Ramanujan (1887-1920) – Brief outline of the life and mathematical career of Ramanujan – Hardy's assessment of Ramanujan and his Mathematics (1922, 1940) – Some highlights of the published work of Ramanujan and its impact – Selberg's assessment of Ramanujan's work (1988) – Rediscovering the tradition (1900-1950) – Rediscovering the tradition (1950-2010) – Modern scholarship on Indian Mathematics (1900-2010) – Development of modern mathematics in India (1910-1950) – Development of modern mathematics in India (1950-2010) – Development of higher education and scientific research in India (1900-1950) – Development of higher education and scientific research in India (1950-2010) – Comparison with global developments

Contact Periods:

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

TEXT BOOKS:

1. Seshadri, C.S., "Studies in History of Indian Mathematics", Hindustan Book Agency, Delhi, 2010.
2. Emch, G.G., Srinivas, M. D., and Sridharan, R., "Contributions to the History of Mathematics in India", Hindustan Book Agency, New Delhi, 2005.
3. Joseph, G.G., "Indian Mathematics Engaging the World from Ancient to Modern Times", World Scientific, London, 2016.

References:

1. https://www.kramasubramanian.com/talks-lectures/indian-science-lectures

EVALUATION PATTERN:

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				100	

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