



**KPR Institute of
Engineering and
Technology**

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MAR 2022 - MAR 2023

INDIA

VII Semester – Open Electives Syllabi B.E. / B.Tech. Programme Regulations – 2021(Revised)

REGULATIONS – 2021 (Revised)**B.E. / B.Tech. Programme****VII SEMESTER – OPEN ELECTIVES****SYLLABI**

SL. NO.	COURSE CODE	COURSE TITLE
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE		
1.	U21ADX06	Introduction to Big Data
2.	U21ADX07	Data Mining: Concepts and Techniques
DEPARTMENT OF BIOMEDICAL ENGINEERING		
1.	U21BMX07	Biomedical Instrumentation
2.	U21BMX08	First aid and Safety for Human
DEPARTMENT OF CHEMICAL ENGINEERING		
1.	U21CHX07	Food Safety and Quality Regulations
2.	U21CHX08	Safety and Hazard Management in Process Industries
DEPARTMENT OF CIVIL ENGINEERING		
1.	U21CEX06	Green Buildings
2.	U21CEX07	Disaster Management
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
1.	U21CSX06	Foundations of AR and VR
2.	U21CSX07	Foundations of Multimedia and Animations
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)		
1.	U21AMX05	Digital Transformation with AI
DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS		
1.	U21CBX06	Marketing Research and Management
2.	U21CBX07	Fintech Regulations
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING		
1.	U21ECX06	Basics of Internet of Things
2.	U21ECX07	Basics of Image Processing

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING		
1.	U21EEX06	Solar PV System: Installation and Maintenance
2.	U21EEX07	Optimization Techniques for Engineering Applications
DEPARTMENT OF INFORMATION TECHNOLOGY		
1.	U21ITX07	Introduction to Computer Forensics
2.	U21ITX08	User Interface Design
DEPARTMENT OF MECHANICAL ENGINEERING		
1.	U21MEX07	Product Design and Development
2.	U21MEX08	Industrial Automation
DEPARTMENT OF MECHATRONICS ENGINEERING		
1.	U21MIX08	Cyber Physical Systems
2.	U21MIX09	Introduction to Industry 4.0
SCIENCE & HUMANITIES		
1.	U21PHX02	Advanced Material Science for Engineers
2.	U21CYX05	Waste Management and Resource Recovery
3.	U21CYX06	Chemical Aspects of Food Adulteration
CENTRE FOR INNOVATION, INCUBATION AND ENTREPRENEURSHIP DEVELOPMENT		
1.	U21CAX02	Innovation and Product Development

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**SEMESTER VII**

U21ADX06	INTRODUCTION TO BIG DATA	Category: OEC				
		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 understand Apache Hadoop, HDFS and Map Reduce
- To learn about Hadoop Eco system

COURSE OUTCOMES:

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

CO1: Identify Big Data and its Business Implications (Understand)

CO2: Explain NoSQL data management (Understand)

CO3: Describe data processing on Distributed File System (Understand)

CO4: Manage Job Execution in Hadoop Environment (Understand)

CO5: Develop Big Data Solutions using Hadoop Eco System (Apply)

CO-PO MAPPING:

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

SYLLABUS:**UNIT I INTRODUCTION TO BIG DATA AND HADOOP**

9

Types of Digital Data – Introduction to Big Data – Big Data Analytics – History of Hadoop – Apache Hadoop – Analysing Data with Unix tools – Analysing Data with Hadoop – Hadoop Streaming – Hadoop Echo System – IBM Big Data Strategy

UNIT II NOSQL DATA MANAGEMENT

9

Introduction to NoSQL – Aggregate data models – Aggregates – Key-value and document data models – Relationships – Graph databases – Schema less databases – MongoDB

UNIT III HADOOP DISTRIBUTED FILE SYSTEM

9

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

UNIT IV MAP REDUCE

9

Anatomy of a Map Reduce Job Run – Failures – Job Scheduling – Shuffle and Sort – Task Execution – Map Reduce Types and Formats – Map Reduce Features

UNIT V HADOOP ECO SYSTEM

9

Pig: Introduction to PIG – Execution Modes of Pig – Comparison of Pig with Databases – Grunt, Pig Latin, User Defined Functions – Data Processing operators. Hive: Hive Shell – Hive Services – Hive Metastore – Comparison with Traditional Databases – HiveQL – Tables – Querying – Data and User Defined Functions. Hbase: HBasics – Concepts – Clients – Hbase Versus RDBMS

Contact Periods:

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

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'reilly Media, 2015
2. Seema Acharya, Subhashini Chellappan, "Big Data Analytics", Wiley, 2015

REFERENCES:

1. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press, 2013
2. Pete Warden, "Big Data Glossary", O'Reily, 2011

EVALUATION PATTERN:

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



DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEMESTER VII

U21ADX07	DATA MINING: CONCEPTS AND TECHNIQUES	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn data warehouse principles and its Architectures
- To understand Data Mining concepts and knowledge discovery process
- To understand the classification problem, clustering and Analysis

COURSE OUTCOMES:

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

CO1: Identifying necessity of Data Mining and Data Warehousing (Understand)

CO2: Familiar with the process of data analysis, identifying the problems, and choosing the relevant models and algorithms (Understand)

CO3: Develop skill in selecting the appropriate data mining algorithm for solving practical problems (Apply)

CO4: Develop ability to design various algorithms based on data mining tools (Apply)

CO5: Create further interest in research and design of new Data Mining techniques and concepts (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I DATA WAREHOUSING

9

Introduction to Data warehouse – Differences between OLAP and OLTP – A Multi dimensional data model – Star, Snow flake and Fact constellation schemas – Measures – Concept hierarchy – OLAP

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Operations in the Multidimensional Data Model – Data warehouse architecture – A three tier Data warehouse architecture – Data warehouse Back-End Tools and Utilities – Metadata Repository – types of OLAP servers – Data warehouse Implementation – Data Warehouse models – Enterprise warehouse

UNIT II DATA MINING 9

Introduction – What is Data Mining – Definition – Knowledge Discovery in Data (KDD) – Kinds of data bases – Data mining functionalities – Classification of data mining systems – Data mining task primitives – Data Preprocessing: Data cleaning – Data integration and transformation – Data reduction – Data discretization and Concept hierarchy

UNIT III ASSOCIATION RULE MINING 9

Association Rules: Problem Definition – Frequent item set generation – The APRIORI Principle – Support and confidence measures – Association rule generation – APRIORI algorithm – FP - Growth Algorithms – Compact Representation of Frequent item Set-Maximal Frequent item set – Closed frequent item set

UNIT IV CLASSIFICATION AND PREDICTION 9

Issues Regarding Classification and Prediction – Classification by Decision Tree Induction – Bayesian Classification – Classification by Back propagation – Classification Based on Concepts from Association Rule Mining – Other Classification Methods – Prediction – Classifier Accuracy

UNIT V CLUSTERING 9

Types of data – Categorization of major clustering methods – K-means partitioning methods – Hierarchical methods – Density based methods, grid based methods, model based clustering methods – Outlier analysis. Mining Complex Types of Data: Multi dimensional Analysis and Descriptive Mining of Complex – Data Objects – Mining Spatial Databases – Mining Multimedia Databases – Mining Time-Series and Sequence Data – Mining Text Databases – Mining the World Wide Web

Contact Periods:

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

TEXT BOOKS:

1. Jiawei Han, Michelin Kamber, "Data Mining-Concepts and techniques", 2nd Edition, Morgan Kaufmann Publishers, Elsevier, 2006
2. Alex Berson, Stephen J.Smith, "Data warehousing Data mining and OLAP", 2nd Edition, Tata McGraw- Hill, 2007

REFERENCES:

1. Arum K Pujari, "Data Mining Techniques", 3rd Edition, Universities Press, 2005
2. Paulraj Ponniah, Wiley, "Data Warehousing Fundamentals", Student Edition, John Wiley & Sons, 2004
3. Ralph Kimball, Wiley, "The Data warehouse Life Cycle Toolkit", Student Edition, 2006



Head of the Department

Department of Computer Applications and Data Science

KPRIET, Kharar, Chandigarh, India

Course No. 1001

EVALUATION PATTERN:

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

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


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DEPARTMENT OF BIOMEDICAL ENGINEERING
SEMESTER VII



U21BMX07	BIOMEDICAL INSTRUMENTATION	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To present the information on the electric potentials inside the human body
- To enrich students with the knowledge of equipment used for cardiovascular and respiratory studies
- To elicit the role of instrumentation in patient monitoring and the safety procedures to be followed

COURSE OUTCOMES:

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

CO1: Explain the potentials originating in the human body (Understand)

CO2: Identify the suitable equipment for cardiovascular measurement (Apply)

CO3: Demonstrate the real life respiratory measurement equipment (Understand)

CO4: Classify patient care and monitoring equipment (Understand)

CO5: Understand the physiological effects of electrical current and importance of safety precautions (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:**UNIT I BIOPOTENTIAL ELECTRODES**

9

Biopotential – Resting potential and action potential – Propagation of action potentials – Bioelectric potentials – Electrode-electrolyte interface – Electrode-skin interface – Types of electrodes

UNIT II CARDIOVASCULAR MEASUREMENT

9

Electrocardiography – Measurement of blood pressure – Measurement of blood flow – Cardiac output measurement – Plethysmography – Measurement of heart sounds

UNIT III MEASUREMENT IN RESPIRATORY SYSTEM

9

Physiology of respiratory system – Tests and instrumentation for the mechanics of breathing – Gas exchange and distribution – Respiratory therapy equipment

UNIT IV PATIENT CARE AND MONITORING

The elements of intensive-care monitoring – Diagnosis – Calibration – Instrumentation for monitoring patients – Pacemakers – Defibrillators

UNIT V ELECTRICAL SAFETY OF BIOMEDICAL EQUIPMENT

Physiological effects of electrical current – Shock hazards from electrical equipment – Methods of accident prevention

Contact Periods:

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

TEXT BOOKS:

1. John G. Webster, "Medical Instrumentation Application and Design", 4th edition, Wiley India Pvt Ltd, New Delhi, 2015
2. Khandpur R S, "Handbook of Biomedical Instrumentation", 3rd edition, Tata McGraw-Hill, 2014
3. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurement", 2nd edition, Prentice Hall of India, 2004

REFERENCES:

1. Joseph J. Carr, John M. Brown, "Introduction to Biomedical Equipment Technology", 1st edition, Pearson Education, 2004
2. Myer Kutz, "Standard Handbook of Biomedical Engineering and Design", 2nd edition, McGraw Hill Publisher, 2003
3. Frederick W Kremkau, "Diagnostic Ultrasound Principles and Instruments", 3rd edition, Saunders Elsevier, 2005

EVALUATION PATTERN:

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

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



DEPARTMENT OF BIOMEDICAL ENGINEERING

SEMESTER VII



U21BMX08	FIRST AID AND SAFETY FOR HUMAN	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To analyze the importance and steps to be taken when delivering first aid
- To identify the first aid needed for the victim
- To interpret various first aid techniques respect to the concern

COURSE OUTCOMES:

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

CO1: Interpret the basic first aid essentials (Understand)

CO2: Assess the necessary conditions and select the suitable first aid (Understand)

CO3: Identify the protocol and precautions for dealing with airway obstructions (Understand)

CO4: Comprehend the steps and safety measures involved in addressing bleeding and shock situations (Understand)

CO5: Report the procedure and precautions for giving first aid for burns, injuries to bones, joints and muscles (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION

9

First aid kit – Dressings – Types of bandages – Self-help – Help for others – Action at an emergency – Rescuer reactions – When and how to call emergency services – Disease precautions

UNIT II PRIMARY SURVEY

9

Primary survey flowchart – Opening the airway – Assessing the breathing – Assessing the circulation – Assessing the disability – Exposing the injury – Physical exam

UNIT III AIRWAY OBSTRUCTIONS AND CPR

9

External chest compressions – Two rescuer CPR – Choking – Finger sweep of the mouth – Choking in infant – Conscious and unconscious choking victims – Life support positioning – Recovery positioning

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UNIT IV BLEEDING AND SHOCK

First aids for internal and external bleeding – Hypoperfusion – Anaphylaxis – Hypovolemic shock – Amputation – Object impalement

UNIT V BURNS AND INJURIES OF BONES, JOINTS AND MUSCLES

First aid for thermal burns and their degrees – Scald burns – Sun burns – Chemical burns – Electrocution – Fractures – Sprains – Cramps – Strains – RICE procedure

Contact Periods:

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

TEXT BOOKS:

1. "Indian First Aid Manual", Indian Red Cross Society, 7th Edition, 2016
2. Nigel Barraclough SR Para CertEd , "First Aid Made Easy – A comprehensive first aid manual and reference guide", 7th Edition , 2008

REFERENCES:

1. "A guide to First Aid in the work place", NT WorkSafe, Department of Employment, Education and Training Northern Territory Government, Revised and Reprinted by July 2003
2. CPR, AED and First Aid | Free Online Course | Alison
3. Online Basic First Aid Course - FutureLearn

EVALUATION PATTERN:

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

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





DEPARTMENT OF CHEMICAL ENGINEERING

SEMESTER VII

U21CHX07	FOOD SAFETY AND QUALITY REGULATIONS	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To give an idea of different types of food hazards, physical, chemical and biological in the industry and food service establishments
- To impart knowledge on regulatory and statutory bodies in India and the World
- To ensure processed food meets global standards

COURSE OUTCOMES:

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

CO1: Understand different type of food hazards (Understand)

CO2: Apply the knowledge of food quality control methods (Apply)

CO3: Identify risk management associated with quality control of food (Apply)

CO4: Gain knowledge on regulatory and statutory bodies in India and the World (Understand)

CO5: Understand the importance of processed foods and global standards (Understand)

CO-PO MAPPING:

POs COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSG1	PSO2
CO1	3	2	-	2	-	-	-	3	-	-	-	-	1	
CO2	3	2	-	2	-	-	-	3	-	-	-	-	1	
CO3	3	2	-	2	-	-	-	3	-	-	-	-	1	
CO4	3	2	-	2	-	-	-	3	-	-	-	-	1	
CO5	3	2	-	2	-	-	-	3	-	-	-	-	1	
Correlation levels:		1: Slight (Low)			2: Moderate (Medium)			3: Substantial (High)						

SYLLABUS:

UNIT I INTRODUCTION

9

Introduction to food safety and security – Hygienic design of food plants and equipments – Food contaminants (Microbial, Chemical and Physical) – Food adulteration – Food additives – Food packaging and labelling

UNIT II FOOD QUALITY

9

Introduction – Various quality attributes of food –Instrumental – Chemical and Microbial quality control – Sensory evaluation of food and statistical analysis – Water quality and other utilities

UNIT III QUALITY CONTROL

9

Food quality and quality control including HACCP system – Food Inspection – Food law – Risk assessment – Microbial risk assessment – Dose response and exposure response modelling – Risk management – Implementation of food surveillance system to monitor food safety

UNIT IV REGULATIONS

9

Indian and global regulations – FAO in India – Technical cooperation programmes – Bio-security in Food and Agriculture – World Health Organization (WHO) – World Animal Health Organization – International Plant Protection Convention (IPPC)

UNIT V REGULATORY COMMITTEES

9

Codex Alimentarius Commission – Codex India – Role of Codex Contact Point – National Codex Contact Point – National Codex Committee if India – Functions – Shadow Committees

Contact Periods:

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

TEXT BOOKS:

1. Neal D. Fortin, "Food Regulation: Law, Science, Policy, and Practice", 2nd Edition, Wiley Blackwell, 2007
2. Pulkit Mathur, "Food Safety and Quality Control", 1st Edition, The Orient Blackswan, 2018

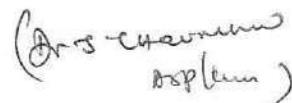
REFERENCES:

1. Deshnande S S, "Handbook of Food Toxicology", 1st edition, CRC Press Inc, 2002
2. Cynthia A. Roberts, "The Food Safety Information Handbook", 3rd Edition, Oryx Press Inc, 2001

EVALUATION PATTERN:

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

U21CHX08	SAFETY AND HAZARD MANAGEMENT IN PROCESS INDUSTRIES	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To give an idea about different hazards and other safety procedures to be followed in any industry
- To impart comprehensive knowledge of industrial safety and occupational health
- To impart knowledge to the students about source of hazard and control techniques

COURSE OUTCOMES:

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

CO1: Understand the practices affecting people, property and the environment and to find out appropriate strategies designed to mitigate risk (Understand)

CO2: Identify the hazardous element dust to fire, radiation, electrical and atmospheric contaminants (Understand)

CO3: Apply the knowledge on handling and storage of hazardous chemicals (Apply)

CO4: Analyze quantitative risk assessment using HAZOP, FMEA and fault tree analysis (Apply)

CO5: Understand the safety principles to identify the fire hazards and its safety protecting systems in practices (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	-	-	-	2	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	2	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	2	-	-	-	-	-	-	-	-

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

SYLLABUS:**UNIT I ACCIDENT STATISTICS**

9

Introduction – Safety program – Engineering ethics – Accident and loss statistics – Acceptable risk – Public perception – Toxic chemicals – Dust – Gases – Vapors – Smoke – Fumes

UNIT II TOXICOLOGY

9

Toxicology dose vs Response – Effects of toxicants on human – Toxicants entry route – Concept of threshold limits – Acute and Chronic exposure – Personal monitoring

UNIT III BASICS OF FIRE AND EXPLOSION 9

Definitions – Fire Triangle – Flammability characteristics of liquids and vapors –Hazards due to fire – LOC and Inerting – Design for fire prevention and control

UNIT IV RISK ASSESSMENT 9

Risk analysis –Risk assessment – Qualitative and Quantitative risk assessment – Hazard and operability studies (HAZOP) – Fault tree analysis (FTA) – Failure mode and effect analysis (FMEA)

UNIT V FIRE AND EXPLOSION CONTROL 9

Fire and explosion – Types of fire – Fire pyramid – Types of fire extinguishers and its handling – Fire fighting techniques – Types of alarm system

Contact Periods:

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

TEXT BOOKS:

1. Daniel A. Crowl and Joseph F. Louvar, "Chemical Process Safety, Fundamentals with Applications", 3rd edition, Prentice Hall, New Jersey, 2015
2. Trevor Kletz, "Still Going Wrong, Case Histories of Process Plant Disasters and How They Could Have Been Avoided", 1st Edition, Gulf Professional publishing, 2003

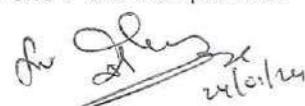
REFERENCES:

1. Frank P. Less, "Loss Prevention in the Process Industries: Hazard Identification, Assessment and Control", 1st Edition, Butterworths, 2007
2. Deshmukh L M, "Industrial Safety Management: Hazard Identification and Risk Control", 1st Edition, McGraw Hill Education, New Delhi, 2005

EVALUATION PATTERN:

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

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



Dr. S. Ravikumar
ASP / clu



U21CEX06	GREEN BUILDINGS	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce the green composite techniques for buildings
- To explain the importance of recycling materials and techniques involved in green buildings
- To emphasize the significance of sustainable development and construction through solar energy

COURSE OUTCOMES:

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

CO1: Infer the fundamental philosophy of environmental implications (Understand)

CO2: Understand the importance of recycling materials (Understand)

CO3: Outline the behaviour of thermal comfort in green buildings (Understand)

CO4: Explain the utility of solar energy in green buildings (Understand)

CO5: Summarize the concepts of green composites (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:**UNIT I SOURCES OF WATER AND ITS CONVEYANCE**

9

Energy use, carbon emissions, water use, waste disposal – Green building materials: sources, methods of production and environmental implications – Maintenance Energy for Buildings – Indian Green building Council

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES

9

Resources for Building Materials in construction – Alternative concepts – Recycling of Industrial and Buildings Wastes – Biomass Resources for buildings



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Department of Civil Engineering

KPRIET Institute of Engineering & Technology

Arasur, Coimbatore-641407

UNIT III COMFORTS IN BUILDING

Thermal Comfort in Buildings – Issues – Heat Transfer Characteristic of Building Materials and Building Techniques – Incidence of Solar Heat on Buildings – Implications of Geographical Locations

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS

9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings – Low Energy Cooling – Case studies of Solar Passively Cooled and Heated Buildings

UNIT V GREEN COMPOSITES FOR BUILDINGS

9

Concepts of Green Composites – Water Utilization in Buildings – Low Energy Approaches to Water Management – Management of Solid Wastes – Management of Sewage – Biogas generation

Contact Periods:

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

TEXT BOOKS:

1. Jagadish, K. S., Venkataramareddy, B. U. and Nanjundarao, K. S. "Alternative Building Materials and Technologies" New Age International, 2nd Edition, 2007.
2. Ursula Eicker, "Low Energy Cooling For Sustainable Buildings", John Wiley and Sons Ltd, 3rd edition, 2009.
3. Sustainable Building Design Manual. Vol. 1 and 2, TERI, New Delhi, 4th Edition, 2004.

REFERENCES:

1. Osman Attmann, "Green Architecture Advanced Technologies and Materials", McGraw Hill, 4th Edition, 2010.
2. Jerry Yudelson, "Green building Through Integrated Design", McGraw Hill, 6th Edition, 2009.
3. Marian Keeler and Bill Burke, "Fundamentals of Integrated Design for Sustainable Building", US Green Building Council, 2nd Edition, 2009.

EVALUATION PATTERN:

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

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

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DEPARTMENT OF CIVIL ENGINEERING

SEMESTER VII

U21CEX07	DISASTER MANAGEMENT	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce the types of disasters, their significance and management techniques
- To understand the factors causing disaster
- To know about various disaster management schemes

COURSE OUTCOMES:

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

CO1: Understand the different types of disasters (Understand)

CO2: Discuss the risk assessment and vulnerability (Understand)

CO3: Explain the rehabilitation techniques and precaution in disaster management (Understand)

CO4: Apply the Knowledge of training and practical oriented program in disaster management (Understand)

CO5: Summarize the various disaster mitigation techniques (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	-	-	1	-	-	-	-	-	-	-	
CO3	2	-	2	-	-	1	2	-	-	-	-	-	-	
CO4	2	2	2	-	-	1	2	-	2	2	-	-	-	
CO5	2	-	2	-	-	-	-	2	-	-	-	-	-	

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

SYLLABUS:

UNIT I INTRODUCTION

9

Disasters: Types of disasters – Natural Disaster such as Earthquake, Landslide, Flood, Drought, Fire – Man Made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism – Causes, effects and practical examples for all disasters

UNIT II DISASTER MANAGEMENT

9

Early Warning Systems – Preparedness through (IEC) Information, education & communication – Hazard Monitoring, Digital Image Processing and spatial Analysis – Application of Geo informatics in Preparedness and Response – Geospatial Technologies in Hazard, Vulnerability and Risk Mapping

UNIT III RECOVERY AND REHABILITATION 9

Reconstruction and Rehabilitation as a Means of Development – Damage Assessment – Post Disaster effects and Remedial Measures – Creation of Long-term Job Opportunities and Livelihood Options – Disaster Resistant House Construction – Sanitation and Hygiene – Education and Awareness – Dealing with Victims' Psychology – Long-term Counter Disaster Planning – Role of Educational Institute

UNIT IV TRAINING, AWARENESS PROGRAM AND PROJECT ON DISASTER MANAGEMENT 9

Training and drills for disaster preparedness – Awareness generation program – Usages of GIS and Remote sensing techniques in disaster management – Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in India

UNIT V DISASTER MITIGATION AND MANAGEMENT 9

Pre-disaster stage (mitigation), Effect to mitigate natural disaster at national and global levels – International strategy for disaster reduction, Emerging approaches in Disaster Management – Concept of disaster management – National disaster management framework; financial arrangements – Role of NGOs, community – Based organizations and media

Contact Periods:

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

TEXT BOOKS:

1. Dave R K, "Disasters: Management in India – Challenges and Strategies", Prowess Publishing, Chennai, 4th edition, 2018.
2. Sulthey M, "Disaster Management", PHI Learning PVT Ltd, New Delhi, 2nd Edition, 2016.
3. Chakraborty, S C, "Natural Hazards and Disaster Management", Pargatishil Prokashak, Kolkata, 4th edition, 2007.

REFERENCES:

1. Singhal J P, "Disaster Management", Laxmi Publications, 6th edition, 2010.
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2nd Edition, 2012.
3. Gupta Anil K, Sreeja S, "Environmental Knowledge for Disaster Risk Management", NIDM, New Delhi, 3rd Edition 2011.
4. Kapur Anu, "Vulnerable India: A Geographical Study of Disasters", IIAS and Sage Publishers, New Delhi, 4th edition, 2010.

EVALUATION PATTERN:

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

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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER VII

U21CSX06	FOUNDATION OF AR AND VR	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To impart the fundamental aspects and principles of AR/VR technologies
- To acquire knowledge of geometric modeling in Virtual Reality, including virtual object shape and appearance
- To explore Virtual Reality programming using toolkits and scene graphs

COURSE OUTCOMES:

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

CO1: Describe the basic concepts of AR and VR (Understand)

CO2: Outline the tools and technologies related to AR/VR (Understand)

CO3: Illustrate the working principle of AR/VR related Sensor devices (Understand)

CO4: Design of various models using modeling techniques (Apply)

CO5: Develop AR/VR applications in different domains (Apply)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION

9

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies-Input Devices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System

UNIT II VR MODELING

9

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants – Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management

UNIT III VR PROGRAMMING

9

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNIT IV APPLICATIONS

9

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education

UNIT V AUGMENTED REALITY

9

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation-Navigation-Wearable devices

Contact Periods:

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

TEXT BOOKS:

- Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018
- Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016

REFERENCES:

- John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004
- William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003

EVALUATION PATTERN:

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

U21CSX07	FOUNDATIONS OF MULTIMEDIA AND ANIMATIONS	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire knowledge on basic elements, file handling techniques of multimedia
- To understand the concept of multimedia on the web
- To develop a fundamental understanding of the principles and techniques of 2D and 3D animation

COURSE OUTCOMES:

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

- CO1: Describe the basic elements of multimedia and file formats (Understand)
- CO2: Interpret conceptual knowledge to solve issues related to emerging electronic technologies and graphic design (Understand)
- CO3: Illustrate the importance of web-based multimedia usage (Understand)
- CO4: Apply color theory and basics to create visually appealing animations, including color palettes, shading, and lighting (Apply)
- CO5: Apply shading techniques and use materials and shaders to create realistic and visually appealing 3D models (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I BASIC ELEMENTS 9

Creation – Editing – Design – Usage – Tools and Hardware – File Formats for Text – Image / Graphics – Audio – Video – Multimedia data interface standards – Multimedia databases

UNIT II MULTIMEDIA FILE HANDLING 9

Compression and decompression – Data and file format standards – Multimedia I/O technologies – Digital voice and audio – Video, image and animation – Full motion video – Storage and retrieval technologies

UNIT III MULTIMEDIA ON THE WEB 9

Hypertext – Hypermedia – Hypermedia Structures and Formats – Web Graphics – Web Design Guidelines – HTML5 – Plugins – Multimedia Networking

UNIT IV INTRODUCTION TO 2D ANIMATION 9

Introduction to 2D Animation – Drawing concept – Color theory & basics – Incorporating sound into 2D animation

UNIT V INTRODUCTION TO 3D ANIMATION 9

Introduction to 3D space in Blender – Introduction to Modeling Techniques – In- organic Modeling – Organic Modeling - 3D Shading - Use of Materials & Shader - Shader and Texture editing

Contact Periods:

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

TEXT BOOKS:

1. Prabhat K. Andleigh and Kiran Thakrar, "Multimedia Systems Design", First Edition, Pearson, 2015
2. Ranjan Parekh, "Principles of Multimedia", Second Edition, McGraw Hill Education, 2017
3. Welles, Paul. Fundamentals of Animation, Ava Publishing, 2006

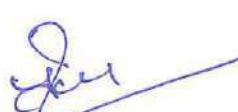
REFERENCES:

1. Ze - Nian Li, Mark S Drew and Jiangchuan Liu, "Fundamentals of Multimedia", Second Edition, Springer, 2014
2. Thomas, Frank, and Ollie Johnston. "The Illusion of Life: Disney Animation", Disney Editions, 1995
3. Allen, Eric & Murdock, Kelly L, "Body Language: Advanced 3D Character Rigging", Sybex Publication, 2008

EVALUATION PATTERN:

Continuous Internal Assessments				Total Internal Assessments	End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)			
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test		
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 COMPUTER SCIENCE AND ENGINEERING (AIML)

SEMESTER VII

U21AMX05	DIGITAL TRANSFORMATION WITH AI	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce the concept of digital transformation and the role of Artificial Intelligence in it.
- To explore how AI applications are revolutionizing industries.
- To familiarize students with core AI concepts through case studies and practical demonstrations.
- To enable students to think critically about the ethical and social implications of AI.

COURSE OUTCOMES:

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

CO1: Explain AI fundamentals and its role in digital transformation initiatives. (Understand)

CO2: Demonstrate understanding of core AI technologies and their practical applications (Apply)

CO3: Identify AI applications across key industries for digital transformation benefits (Apply)

CO4: Analyze ethical, legal, and societal implications of responsible AI systems (Apply)

CO5: Build simple AI applications using no-code tools and generative AI (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I FOUNDATIONS OF DIGITAL TRANSFORMATION & AI

9

Evolution from digitization to digital transformation – Key technologies enabling digital transformation
– Introduction to Artificial Intelligence: Definition, Goals, Applications – Difference between AI, ML, DL, and Data Science – Role of AI in business and everyday life

UNIT II CORE AI TECHNOLOGIES AND CONCEPTS

9

Machine Learning Basics: Supervised, Unsupervised, Reinforcement Learning – Introduction to Deep Learning: Neural Networks and Use Cases – Natural Language Processing (NLP): Chatbots,



UNIT II INNOVATION AND REGULATION

9

The technology market and the law – Regulation and Innovation in Banking and Finance – Regulations of Fintech Firms and their role in Market-Based Chains – Current Regulatory Approach – Fintech Innovations in Banking – Asset Management – Insurance – Pensions and Healthcare Schemes– Patentability of FinTech inventions.

UNIT III CROWD FUNDING AND DIGITAL ASSETS

9

Types of crowd funding – The Jobs Act – Regulation crowd funding – Regulation A+ – Regulation D crowd funding – Intrastate offerings – Digital Assets – Three uses of Digital Assets – Digital Asset Forks – Initial Coin Offerings – Regulatory Framework for Digital and Crypto Assets – Central Bank Digital Currencies.

UNIT IV MARKET PLACE LENDING AND MOBILE PAYMENTS

9

Online Lending Business Models – Payday Loans – Consumer Protection Laws – Debt Collection – Equal Credit Opportunity Act – Contract Formation and the E-Sign Act – Military Lending Act – Securities Laws Considerations – Mobile Devices – Payment Cards and the Law – Truth in Lending Act and Regulation – Z-Card Act – Electronic Fund Transfer Act and Regulation E – Fair Credit Reporting Act – Federal Bank Secrecy Act – State Money Transmitter Laws.

UNIT V ANTI - MONEY LAUNDERING AND CYBERSECURITY

9

Reporting requirements under the Bank Secrecy Act – Patriot Act – Penalties for violating the BSA – Virtual currencies and the Bank Secrecy Act – Cyber security Frameworks – Cyber security Act of 2015 – Contractual and Self Regulatory obligations.

Contact Periods:

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

TEXT BOOKS:

1. Jelena Madir, "FinTech – Law and Regulation", 1st Edition, Edward Elgar Publishing Limited, 2019.
2. Valerio Lemma, "Fintech Regulation : Exploring New Challenges of the Capital Markets Union", 1st Edition ,Palgrave Macmillan, 2020.
3. Chris Brummer, "Fintech Law in a Nutshell", 1st Edition, West Academic Publishing, 2020.

REFERENCES:

1. Bernardo Nicoletti, "The Future of Fintech, Integrating Finance and Technology in Financial Services", 1st Edition, Springer Nature, 2017.
2. Kevin C. Taylor, "FinTech Law : A Guide to Technology Law in the Financial Services Industry", 1st Edition, BNA Books, 2014.
3. Lee Reiners, "FinTech Law and Policy", 1st Edition, Academic Publishing, 2018.



DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

SEMESTER VII

U21CBX06	MARKETING RESEARCH AND MANAGEMENT	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To explore and understand the need for study of Marketing and Marketing Research
- To apply the acquired skill into real world problems
- To analyze marketing management tools for competitive advantage

COURSE OUTCOMES:

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

CO1: Understand the basic marketing concepts and the consumer (Understand)

CO2: Analyze the market planning, needs and trends in the environment along with the market segmentation (Understand)

CO3: Apply the pricing, promotion and distribution strategy in product management (Apply)

CO4: Analyze the data using the statistical tools and perform business to business marketing (Apply)

CO5: Apply the concepts of Business-to-Business marketing for real world applications (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I MARKETING CONCEPTS

9

Introduction to Marketing & Core Concepts – Marketing of Services – Importance of marketing in service sector – Marketing Planning & Environment: Elements of Marketing Mix – Analyzing needs & trends in Environment – Macro, Economic, Political, Technical & Social– Understanding the consumer:


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 Arasur, Coimbatore - 641407.

Determinants of consumer behaviour – Factors influencing consumer behaviour – Market Segmentation: Meaning & Concept – Basis of segmentation, selection of segments – Market Segmentation strategies– Target Marketing– Product Positioning.

UNIT II MARKETING RESEARCH AND DATA ANALYSIS 9

Introduction – Type of Market Research – Scope, Objectives & Limitations–Marketing Research Techniques – Survey Questionnaire design & drafting – Pricing Research – Media Research – Qualitative Research. Data Analysis: Use of various statistical tools – Descriptive & Inference Statistics – Statistical Hypothesis Testing – Multivariate Analysis – Discriminant Analysis, Cluster Analysis– Segmenting and Positioning – Factor Analysis.

UNIT III PRODUCT MANAGEMENT AND DECISIONS 9

Product Management: Product Life cycle concept – New Product development & strategy – Stages in New Product development – Product decision and strategies – Branding & packaging – Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity – 5 M's of Advertising Management – Marketing Channels, Retailing, Marketing Communication, Advertising.

UNIT IV INTERNET MARKETING 9

Internet Marketing– Introduction to Internet Marketing – Mapping fundamental concepts of Marketing (7Ps, STP) – Strategy and Planning for Internet Marketing – Digital Marketing.

UNIT V B2B MARKETING 9

Business to Business Marketing – Fundamental of business markets – Organizational buying process – Business buyer needs – Market and sales potential. Product in business markets – Price in business markets – Place in business markets – Promotion in business markets – Relationship, networks and customer relationship management – Business to Business marketing strategy.

Contact Periods:

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

TEXT BOOKS:

1. Philip Kotler, Keller Kevin, "Marketing Management", 4th Edition, Pearson education, 2019.
2. Deepak, R. Kanthiah Alias, S. Jeyakumar, "Marketing Management", 2nd Edition, Educreation Publishing, 2019.

REFERENCES:

1. Hollensen, S, "Marketing Management: A relationship approach", 2nd Edition, Pearson Education, 2019.
2. Malhotra, N. K., Nunan, D., & Birks, D. F. , "Marketing research: An applied approach", 1st Edition, Pearson Education Limited, 2019.
3. Nargundkar ,R, "Marketing research: Text and cases", 1st Edition, McGraw-Hill Education, 2020.



Dr. A. BAZILA BANU, M.E (CSE), Ph.D.
 Professor & Head
 Department of Computer Science and Business System
 KPR Institute of Engineering and Technology,
 Arasur, Coimbatore - 641407.

EVALUATION PATTERN:

Continuous Internal Assessments				Total Internal Assessments	End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)			
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test		
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 COMPUTER SCIENCE AND BUSINESS SYSTEMS

SEMESTER VII

U21CBX07	FINTECH REGULATIONS	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the significance of Fintech in Business
- To gain exposure on Fintech Laws and Regulations
- To acquire the knowledge of Regulations of Fintech firm and their role in Market

COURSE OUTCOMES:

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

CO1: Understand the basics of fintech regulations (Understand)

CO2: Analyze various Regulatory approaches on fintech, market based chains and asset management (Understand)

CO3: Understand the crowd funding regulations and digital asset management (Understand)

CO4: Analyze different acts of online lending business models and e-payment services (Understand)

CO5: Understand the fundamentals of Bank secrecy Act and security regulatory obligations (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION

9

The Role of the Regulators – Equal Treatment and Competition – Need for a regulatory assessment of Fintech, India Regulations – The Risks to Consider – Regtech and SupTech – The Rise of TechFins, Regulatory sandboxes – compliance and whistle blowing.

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 Professor & Head
 Department of Computer Science and Business Systems
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EVALUATION PATTERN:

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

U21ECX06	BASICS OF INTERNET OF THINGS	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To study the basics of IoT and Arduino development boards
- To understand the hardware and software for IoT design for an application
- To apply different cloud interfaces of IoT for real time applications

COURSE OUTCOMES:

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

CO1: Explain the basic principles of Internet of Things (Understand)

CO2: Summarize the characteristics of different Arduino boards (Understand)

CO3: Develop the basic projects using sensor and actuator interfaces (Apply)

CO4: Compare the performance of various communication protocols (Analyze)

CO5: Apply the concept of Internet of Things 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	2	-	-	-	-	-	-	-	-	-	-	-	2	
CO2	2	-	-	-	2	-	-	-	-	-	-	-	2	
CO3	3	2	2	-	2	-	-	-	-	-	-	-	2	
CO4	3	3	2	-	2	-	-	-	-	-	-	-	2	
CO5	3	2	2	-	2	-	-	-	-	-	-	-	2	

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

SYLLABUS:

UNIT I BASICS OF INTERNET OF THINGS

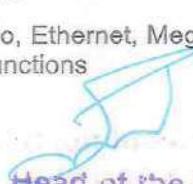
9

Definition and characteristics – Physical design – Logical design – IoT enabling technologies – IoT levels and deployment templates – IoT architecture – Domain specific IoTs – Environment, industry, health and life style

UNIT II ARDUINO PROGRAMMING

9

Arduino families – Uno, Nano, Leonardo, Ethernet, Mega2560 – Shields-motor, wireless SD, Wi-Fi, GSM-IDE tool – Arduino libraries and functions



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UNIT III INTERFACING OF SENSORS AND ACTUATORS 9

Humidity sensor – Temperature sensor – Water detector/sensor – MQ2 sensor – Ultrasonic sensor– Magnetic relay switches – Servo motors – Stepper motors

UNIT IV NETWORKING WITH ESP8266 WiFi 9

Hardware configuration – Installation of Arduino IDE for ESP8266 – Communication protocols – Serial communication, I2C protocols, SPI protocols – Cloud interfacing – Blynk protocols, thing speak and MQTT protocols

UNIT V APPLICATIONS OF IoT 9

Case studies – Home intrusion detection, smart parking, weather monitoring system, smart irrigation, air pollution monitoring and renewable energy systems

Contact Periods:

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

TEXT BOOKS:

1. James A. Langbridge, "Arduino Sketches tools and techniques for programming", wizardry Wiley, 1st edition, 2015
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach", 1st edition, VPT Publishers, 2014

REFERENCES:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", 1st edition, Cisco Press, 2017
2. Marco Schwartz, "Internet of Things with ESP8266", 1st edition, Packt Publishing, 2016
3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", 1st edition, Wiley Publishers, 2013
4. Ovidiu Vermesan, Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", Original edition, River Publishers, 2013

EVALUATION PATTERN:

Continuous Internal Assessments				Total Internal Assessments	End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)			
*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Mini Project / MCQ	Written Test	200	100
40	60	40	60	40	60
Total				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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Translation – Computer Vision: Object Detection, Face Recognition – AI Tools and Platforms (Overview): ChatGPT, Google AutoML, IBM Watson

UNIT III INDUSTRY APPLICATIONS OF AI IN DIGITAL TRANSFORMATION 9

Smart Manufacturing: Predictive Maintenance, Robotics – AI in Healthcare: Diagnosis, Drug Discovery, Wearables – AI in Agriculture: Crop Monitoring, Yield Prediction – AI in Finance: Fraud Detection, Algorithmic Trading – AI in Transportation and Smart Cities

UNIT IV ETHICAL, LEGAL, AND SOCIAL ASPECTS OF AI 9

AI Bias and Fairness – Privacy and Data Security – Explainable AI and Transparency – Legal implications and global regulations – Human-centric and Responsible AI Design

UNIT V AI TOOLS, PLATFORMS & HANDS-ON EXPLORATION 9

Introduction to No-Code/Low-Code AI Platforms: Google Teachable Machine, Lobe.ai, Microsoft Power Platform – Building AI Models without Coding: Image classification using Teachable Machine – Exploring Generative AI Tools: Introduction to ChatGPT, DALL·E, Use cases in creative industries, marketing, and automation – Hands-on: Create a basic AI-powered application

Contact Periods:

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

TEXTBOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", 4th Edition, MIT Press, 2020.
2. Ajay Agrawal, Joshua Gans, Avi Goldfarb, "Prediction Machines: The Simple Economics of Artificial Intelligence", 1st Edition, Harvard Business Review Press, 2018.
3. Klaus Schwab, "The Fourth Industrial Revolution", World Economic Forum, 2017.

REFERENCES:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 4th Edition, Pearson, 2020.
2. Tom Taulli, "Artificial Intelligence Basics: A Non-Technical Introduction", 1st Edition, Apress, 2019.
3. Jerry Kaplan, "Artificial Intelligence: What Everyone Needs to Know", 1st Edition, Oxford University Press, 2016.
4. Eric Topol, "Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again", Basic Books, 2019.

EVALUATION PATTERN:

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

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





SEMESTER VII

U21ECX07	BASICS OF IMAGE PROCESSING	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To study the basic elements of image processing
- To learn techniques for improving quality of information in spoilt images
- To apply image segmentation for ROI and compression for saving storage space in an image

COURSE OUTCOMES:

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

CO1: Explain the concept of image fundamentals (Understand)

CO2: Illustrate preprocessing techniques for manipulation of images (Understand)

CO3: Summarize various restoration techniques to recover the degraded image (Understand)

CO4: Examine the image segmentation methods based on region of interest (Analyze)

CO5: Make use of various coding techniques for image compression (Apply)

CO-PO MAPPING:

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

SYLLABUS:**UNIT I DIGITAL IMAGE FUNDAMENTALS**

9

Elements of digital image processing systems – Fundamental steps in image processing – Elements of visual perception, brightness, contrast, hue, saturation, Mach band effect – Colour models – RGB, HSI models – Image sampling and quantization

UNIT II IMAGE ENHANCEMENT

9

Fundamentals of spatial filtering – Histogram processing, equalization and specification techniques – Smoothing and sharpening spatial filters – Filtering in frequency domain – Homomorphic filtering

UNIT III IMAGE RESTORATION

9

Image Restoration – Noise models – Adaptive filter – Notch filter – Linear, Position-Invariant degradation – Inverse filtering – Wiener filtering – Constrained least square filtering

UNIT IV IMAGE SEGMENTATION

9

Point, Line and Edge detection – Edge linking via Hough transform – Global and multivariable thresholding – Region based segmentation – Region growing, region splitting and merging

UNIT V IMAGE COMPRESSION

9

Need for data compression – Huffman coding – Run length encoding – Arithmetic coding – Vector quantization – Transform coding – JPEG and MPEG standard

Contact Periods:

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

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", 4th edition, Pearson Education, 2018
2. Anil K. Jain, "Fundamentals of Digital Image Processing", 1st edition, Pearson Education, 2010

REFERENCES:

1. Jayaraman S, Veerakumar T, Esakkirajan S, "Digital Image Processing", 1st edition, Tata McGraw Hill, 2017
2. S.Sridhar, "Digital Image Processing" , 1st edition, Oxford University press, 2011
3. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "Digital Image Processing using MATLAB", 1st edition, Pearson Education, 2010
4. Alan C. Bovik, "Handbook of image and Video Processing ", 1st edition, Elsevier Academic press, 2010

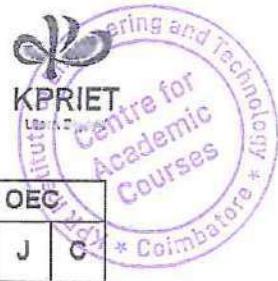
EVALUATION PATTERN:

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				
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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U21EE06	SOLAR PV SYSTEM: INSTALLATION AND MAINTENANCE	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the renewable energy sources and its harnessing methods
- To acquire knowledge on PV system design, installation for various applications
- To apply the knowledge of maintenance process and safety procedures in renewable energy integration

COURSE OUTCOMES:

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

- CO1: Summarize the solar power production and its development in India (Understand)
 CO2: Distinguish various methods of power extraction from solar energy (Understand)
 CO3: Describe about PV module production and its various applications (Understand)
 CO4: Demonstrate an efficient PV system installation for a firm (Understand)
 CO5: Apply engineering knowledge for maintenance and safety procedures in PV systems (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:**UNIT I RENEWABLE ENERGY SOURCES**

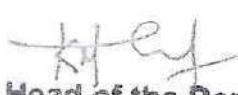
9

Basics of renewable energy sources – Energy scenario – Impact of solar energy on environment – Benefits and limitations of solar power – Solar PV system scenario in international and India

UNIT II SOLAR POWER HARNESSING METHODS

9

Solar energy – Energy calculation method – Solar photovoltaic system – Standalone system, grid-connected system


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UNIT III PV POWER SYSTEM

PV module design – PV module fabrication process – PV array formation – Charge controller – System wiring – Batteries – Arrays – Loads – Inverters

9

UNIT IV INSTALLATION PROCEDURE

Topologies of PV system – PV array sizing – Battery sizing – Installation procedure in PV module – MPPT technique overview – Inverter and battery installation procedures – Installation for commercial and domestic purpose – Wiring and metering

9

UNIT V MAINTENANCE AND SAFETY WITH PV SYSTEM

Inspection procedures – Maintenance procedures: Scheduling – Metering – Safety in installation and environment – Fire hazard – Electric hazard

Contact Periods:

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

TEXT BOOKS:

- Chetan Sing Solanki, "Solar Photovoltaics Fundamentals, Technologies and Application", 3rd edition, PHI Learning Private Limited, 2018
- Rosalie Wills, James A. Milke, Sara Royle and Kristin Steranka, "Best Practices for Commercial Roof-Mounted Photovoltaic System Installation", 2nd edition, Springer, 2015

REFERENCES:

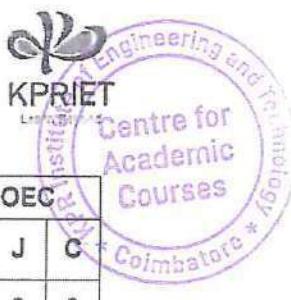
- Yogi Goswami D, Frank Kreith and Jan F. Kreider, "Principles of Solar Engineering", 2nd edition, Taylor and Francis, 2003
- Miguel A. Sanz-Bobi, "Use, Operation and Maintenance of Renewable Energy Systems Experiences and Future Approaches", 1st edition, Springer, 2016
- Architectural Energy Corporation, Colorado, "Maintenance and Operation of Stand-Alone Photovoltaic Systems", Photovoltaic Design Assistance Center, Sandia National Laboratories, Albuquerque, 1991

EVALUATION PATTERN:

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

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

[Signature]
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U21EEX07	OPTIMIZATION TECHNIQUES FOR ENGINEERING APPLICATIONS	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge on various optimization techniques
- To understand the operations of optimization techniques
- To apply the techniques through modern tool in engineering applications

COURSE OUTCOMES:

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

- CO1: Explain the concept of optimization techniques (Understand)
 CO2: Apply the concept of optimization techniques for solving linear and non-linear problems (Apply)
 CO3: Solve the un-constrained optimization problems (Apply)
 CO4: Solve the constrained optimization problems (Understand)
 CO5: Use modern tool for finding optimized solution of the problems (Apply)

CO-PO MAPPING:

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

SYLLABUS:**UNIT I OPTIMIZATION CONCEPTS**

9

Optimization and Terminology – Concepts and Definitions – Statement of an optimization problem – Problem formulation: Objectives – Constraints – Classification – Function of one and multiple variables – Derivative based optimization – MATLAB Programming

UNIT II LINEAR AND NON-LINEAR PROGRAMMING

9

Introduction – Applications of Linear Programming (LP) – Standard form of a LP problem – Definitions and theorems – Simplex algorithm – One-Dimensional minimization methods – Elimination methods – Interpolation methods – MATLAB Solution of One-Dimensional Minimization Problems

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UNIT III UNCONSTRAINED OPTIMIZATION TECHNIQUES

Unconstrained optimization problem modelling – Gradient based method: Cauchy's steepest descent method, Newton's method, Conjugate gradient method – MATLAB Solution of Unconstrained optimization problems

UNIT IV CONSTRAINED OPTIMIZATION TECHNIQUES

Constrained optimization problems – Direct methods – Penalty function methods – Steepest descent method – MATLAB Solution of Constrained Optimization Problems

UNIT V MODERN METHODS OF OPTIMIZATION

Particle Swarm Optimization – Genetic Algorithms – Ant Colony Optimization – Optimization of Fuzzy Systems – Neural-Network-Based Optimization – Optimization toolbox

Contact Periods:

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

TEXT BOOKS:

1. Singiresu S. Rao, "Engineering Optimization Theory and Practice" 5th edition, Wiley, 2019
2. Russell Rhinehart. R, "Engineering Optimization Applications, Methods and Analysis", 1st edition, Wiley-ASME press, 2018

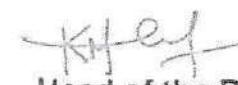
REFERENCES:

1. Cesar Lopez, "MATLAB Optimization Techniques", 2nd edition, Springer A press, 2014
2. Edwin K.P. Chong and Stanislaw H. Zak, "An Introduction to Optimization", 4th edition, Wiley, 2013
3. NPTEL course on "Optimization from fundamentals" by Prof. Ankur A. Kulkarni,IIT Bombay

EVALUATION PATTERN:

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

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


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U21ITX07	INTRODUCTION TO COMPUTER FORENSICS	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To describe the knowledge requirement for computer forensics and documenting the evidence
- To understand the process of online investigations
- To explore the different category of cyber forensics

COURSE OUTCOMES:

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

CO1: Explain the scope for computer forensics and file system for digital crime investigations (Understand)

CO2: Describe the process of acquiring and documenting computer forensic evidence for investigation (Understand)

CO3: Understand the process of online investigations to resolve security disputes (Understand)

CO4: Perform network and mobile forensics in the field of digital communication (Apply)

CO5: Perform digital photographic forensics to resolve crime disputes (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:**UNIT I INTRODUCTION**

9

Scope of computer forensics: Introduction, Types of evidence, Investigator skills, Importance, History of computer forensics, Law enforcement training – Physical and logical storage – Boot process – Windows registry.

UNIT II ACQUIRING EVIDENCE AND DOCUMENTATION

9

Hard disk - Cloning hard disk – Removable memory - Lab requirements, Private sector computer Forensics laboratories, Computer forensics laboratory requirements, Extracting evidence from a device, Documenting the investigation.

UNIT III ONLINE INVESTIGATIONS

Working undercover - Website evidence - Background searches on a suspect - Online crime - Capturing online communications.

UNIT IV NETWORK AND MOBILE FORENSICS

Tools, Networking devices, Understanding the OSI Model, Advanced persistent threats, Investigating a network attack - Cellular network, Handset specifications, Mobile operating systems, Handling Handset Evidence, Handset forensics.

UNIT V MAC AND PHOTOGRAPH FORENSICS

Macintosh file systems, Forensic examination of a MAC, Mac operating systems, Apple mobile devices, Digital photography, Examining picture files, Evidence admissibility, case studies.

Contact Periods:

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

TEXT BOOK:

1. Darren R. Hayes, "A Practical Guide to Computer Forensics Investigations", 1st Edition, Pearson, 2014.

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.
3. Bill Nelson, Amelia Phillips, Christopher Steuart, "Computer Forensics and Investigations", 3rd Edition, Cengage learning, 2010.
4. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics", 2nd Edition, Tata McGraw Hill, 2006
5. <https://www.sans.org/white-papers>.

EVALUATION PATTERN:

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

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

DEPARTMENT OF INFORMATION TECHNOLOGY
 SEMESTER VII

U21ITX08	USER INTERFACE DESIGN	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn the fundamentals of user experience design and interface design
- Examine the interface and screen layout from the user's viewpoint
- Acquire the skills and knowledge necessary to effectively implement user analysis techniques, understand usability concepts, and conduct usability testing procedures

COURSE OUTCOMES:

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

- CO1: Understand the importance of user interface design (Understand)
 CO2: Apply fundamental scientific theories, principles, and techniques to user interface design (Apply)
 CO3: Enumerate interesting possibilities for assisting users in completing activities and create user interfaces for commercial web applications (Understand)
 CO4: Apply the different characteristics of window- and device-based controls to an application (Apply)
 CO5: Develop a comprehensive understanding of the complete design life cycle, including its purpose, process, and the various tools used throughout (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:**UNIT I INTRODUCTION** 9

Human–Computer interface – Characteristics of graphics interface –Direct manipulation graphical system – Web user interface –Popularity –Characteristic & principles.

UNIT II HUMAN COMPUTER INTERACTION 9

User interface design process – Obstacles –Usability –Human characteristics in design – Human

interaction speed –Business functions –Requirement analysis – Direct – Indirect methods – Basic business functions – Design standards – System timings.

UNIT III SYSTEM MENUS AND NAVIGATION SCHEMES

9

Human consideration in screen design – Structures of menus – Functions of menus–Contents of menu– formatting – Phrasing the menu – Selecting menu choice–Navigating menus– Graphical menus.

UNIT IV LAYOUT DESIGN

9

Characteristics– Components– Presentation styles– Types– Managements– Organizations– Operations– Web systems– Device– Based controls characteristics– Screen – Based controls – Operate control – Text boxes– Selection control – Combination control– Custom control– Presentation control.

UNIT V INFORMATION SEARCH AND VISUALIZATION

9

Introduction –Search in textual documents and database querying – Multimedia document Searches - Advanced filtering and search interfaces - Information visualization.

Contact Periods:

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

TEXTBOOKS:

1. Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel, "The Essentials of Interaction Design", 4th edition, Wiley, 2021.
2. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, Niklas Elmqvist, Nicholas Diakopoulos, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", 6th Edition, Pearson, 2018.

REFERENCES:

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interfaces Patterns for effective interaction design", 3rd edition, O'Reilly, 2020.
2. Elizabeth Rosenzweig, "Successful User Experience: Strategies and Roadmaps", 2nd edition, Morgan Kaufmann Publishers In, 2020.

EVALUATION PATTERN:

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

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





DEPARTMENT OF MECHANICAL ENGINEERING

SEMESTER VII

U21MEX07	PRODUCT DESIGN AND DEVELOPMENT	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn about basic concepts of product and industrial design
- To impart knowledge on various steps involved concept selection and testing
- To provide insights about product architecture and design for manufacturing

COURSE OUTCOMES:

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

CO1: Outline the concepts of product life cycle and product planning process (Understand)

CO2: Discuss the steps involved in concept selection and testing (Understand)

CO3: Comprehend the application of CAD and CAE software's in product development process (Apply)

CO4: Outline basic concepts involved in product architecture (Apply)

CO5: Understand the basic concepts of design for manufacturing (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION 8

Product life – Cycle Product – Policy of an organization – Selection of a profitable product – Product design process – Product analysis – A generic development process – Concept development – Generic product development process – Product planning – Steps involved in product planning process

UNIT II CONCEPT GENERATION, SELECTION AND TESTING 8

Plan and establish product specifications – Task – Structured approaches – Clarification – search – Externally and internally – Explore systematically – Reflect on the solutions and processes – Concept selection – Methodology – Benefits – Implications – Product change – Variety – Component standardization – Product performance – Manufacturability – Concept Testing Methodologies

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UNIT III PRODUCT ARCHITECTURE

Product development management – Establishing the architecture – Creation – Clustering – Geometric layout development – Fundamental and incidental interactions – Related system level design issues – secondary systems – Architecture of the chunks – Creating detailed interface specifications – Portfolio Architecture

UNIT IV INDUSTRIAL DESIGN

10

Integrate process design – Managing costs – Robust design – Integrating CAE – CAD – CAM tools – Simulating product performance and manufacturing processes electronically – Need for industrial design – Impact – Design process – Investigation of customer needs – Conceptualization – Refinement – Management of the industrial design process – Technology driven products – User – Driven products – Assessing the quality of industrial design

UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT

10

Definition – Estimation of Manufacturing cost – Reducing the component costs and assembly costs – Minimize system complexity – Prototype basics – Principles of prototyping – Planning for prototypes – Economic Analysis – Understanding and representing tasks – Baseline project planning – Accelerating the project – Project execution

Contact Periods:

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

TEXT BOOKS:

1. Kari T.Ulrich and Steven D.Eppinger, "Product Design and Development", 5th edition McGraw Hill, 2017
2. James G. Bralla, "Design for Manufacturability Handbook", 2nd edition, Tata McGraw Hill, 1998

REFERENCES:

1. Geoffrey Boothroyd, Peter Dewhurst and Winston A.Knight, "Product Design for Manufacture and Assembly", 3rd edition CRC press, 2010
2. Dr. Ali Jamnia, "Introduction to Product Design and Development for Engineers", 1st edition, CRC Press, 2018
3. Kevin Otto, Kristin Wood, "Product Design, Techniques in Reverse Engineering and New Product Development", 1st edition, Pearson, 2003

EVALUATION PATTERN:

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

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



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**SEMESTER VII**

U21MEX08	INDUSTRIAL AUTOMATION	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- Offer learners an introduction to Industrial Automation 4.0
- Facilitate the methods and techniques of Industrial Automation to the business world
- To provide the principles of construction, operation and installation of PLCs, SCADA and DCS

COURSE OUTCOMES:

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

CO1: Choose appropriate automation strategy for production systems (Understand)

CO2: Develop PLC programs for a given application (Apply)

CO3: Distinguish DCS, SCADA and PLC and explain the architecture of DCS (Apply)

CO4: Select the appropriate process control method for the given application (Apply)

CO5: Interface sensors and transducers with DAQ systems (Apply)

CO-PO MAPPING:

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

Correlation levels: 1:Slight (Low)

2:Moderate (Medium)

3:Substantial (High)

SYLLABUS:**UNIT I INTRODUCTION** 8

Automation in production systems – Principles and strategies – Elements, functions – Product production relationships – Manufacturing economics; Evolution of industrial automation – 2.0, 3.0 and 4.0, automated systems – Elements – Functions and levels; sensors and actuators in automation

UNIT II APPLICATIONS OF PLC 10

Programmable logic controllers – Ladder logic diagrams – Timer instructions – On delay – Off delay – Cyclic and retentive timers – Up/down Counters – Control instructions – Data manipulating instructions – Math instructions; Applications of PLC – Motor start and stop – Simple materials handling applications – Automatic water level controller – Automatic lubrication of supplier conveyor belt – Automatic car washing machine – Bottle label detection and process control application

UNIT III SCADA SYSTEM AND ARCHITECTURE 9

Evolution of SCADA – Communication technologies – Monitoring and supervisory functions – SCADA applications in Utility Automation – Industries – SCADA System Components: Schemes –


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Remote Terminal Unit (RTU) – Intelligent Electronic Devices (IED), Communication Network – DCS – SCADA Server – SCADA/HMI Systems – Various SCADA architectures

UNIT IV INDUSTRIAL PROCESS CONTROL 9

Continuous Vs discrete control – Computer process control; study of advanced process control blocks: Statistical Process Control, Model Predictive Control – Fuzzy Logic based Control, Neural – Network based Control – PID Control

UNIT V SIGNAL CONDITIONING AND DAQ SYSTEMS 9

Signal analysis – Amplification – Multiplexing – Filtering – Isolation – Linearization – Digital Data Acquisition system; DAQ hardware and software device drivers – ADC and DAC converters – Interfacing sensors and transducers to Electronics Control systems

Contact Periods:

Lecture: 45 Periods	Tutorial: - Periods	Practical: - Periods	Project: - Periods	Total: 45 Periods
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TEXT BOOKS:

1. Mikell P Groover, "Automation, Production System and Computer Integrated Manufacturing", 3rd edition Prentice Hall Publications, 2015
2. John Webb, Programmable Logic Controllers: Principles and Applications, 5th edition Prentice Hall of India, 2012

REFERENCES:

1. Krishna Kant, "Computer Based Process Control", Prentice Hall of India, 2nd edition, 2013
2. Michael P. Lukas, "Distributed Control Systems: Their Evaluation and Design", Van Nostrand Reinhold Co., 2nd edition, 2016

EVALUATION PATTERN:

Continuous Internal Assessments				End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	Total Internal Assessments
40	60	40	60	200
Total		40		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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U21MIX08	CYBER PHYSICAL SYSTEMS	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire knowledge and skills on various hardware and software design aspects of Cyber-Physical Systems (CPS) - modeling, analysis, and design
- To understand the functions, security and privacy aspects of CPS
- To know the mechatronics system design and its integration systems

COURSE OUTCOMES:

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

- CO1: Explain the fundamentals of cyber physical systems, its potential and challenges (Understand)
 CO2: Infer the various components and architecture of CPS (Understand)
 CO3: Interpret the functions of CPS multitasking and scheduling (Understand)
 CO4: Explain the concepts of CPS in security and privacy aspects (Understand)
 CO5: Design the mechatronics system with integration of CPS for different applications tools (Apply)

CO-PO MAPPING:

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

SYLLABUS:**UNIT I INTRODUCTION**

9

Cyber-Physical Systems (CPS) in the real world, Basic principles of design and validation of CPS, CPS HW platforms: Processors, Sensors, Actuators, CPS network, CPS SW stack RTOS, Scheduling real time control tasks.

UNIT II DESIGN OF EMBEDDED SYSTEMS

9

Types of Processors - Parallelism. Memory architectures - Memory technologies - Memory hierarchy - Memory models. Input and Output - I/O Hardware - Sequential software in a concurrent world - Analog/Digital interface.

UNIT III MULTITASKING AND SCHEDULING

9

Imperative Programs - Threads - Processes and message passing. Scheduling with fixed timing parameters - Memory effects, Multiprocessor/ Multicore scheduling - Accommodating variability and uncertainty- Managing other resources - Rhythmic tasks scheduling.

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UNIT IV SECURITY OF CYBER-PHYSICAL SYSTEMS

Cyber security requirements - Defining security and privacy - Attack model - Counter measures - System theoretic approaches - Examples of security and privacy in action - Approaches to secure cyber-physical systems - Ongoing security and privacy challenges for CPSs- Ethical hacking.

UNIT V DESIGN OF MECHATRONICS SYSTEM AND CPS

V Model and its variants - System boundary definition - Multi-view and multi-level modelling - Topological modelling - Semantic interoperability modelling - Multi-agent modelling - Collaboration modelling - internal block diagrams - multi-agent development platform - Software tools - Java, Modelica. Case Study: Suspension control, Healthcare: Artificial Pancreas/Infusion Pump/Pacemaker, Green buildings: Automated lighting, AC control, Digital twin system.

Contact Periods:

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

TEXTBOOKS:

- Edward A. Lee and Sanjit A. Seshia, "Introduction to Embedded Systems: A Cyber-Physical Systems Approach", 2nd Edition, MIT press, United Kingdom, 2017.
- Song H., Rawat D. B., Jeschke S. and Brecher C., "Cyber-physical systems: foundations, principles and applications", Morgan Kaufmann, United States, 2016.

REFERENCES:

- Rajeev Alu, "Principles of Cyber-Physical Systems", MIT Press, United Kingdom, 2016.
- Rodrigues, Joel Jose PC, Ivan Stojmenovic, and Danda B. Rawat, "Cyber-physical systems: from theory to practice", CRC Press, Florida, 2015.

EVALUATION PATTERN:

Continuous Internal Assessments				Total Internal Assessments	End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)			
*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	*Individual Assignment / Case Study / Seminar / Project / MCQ	Written Test	200	100
40	60	40	60	40	60
Total				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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U21MIX09	INTRODUCTION TO INDUSTRY 4.0	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES:

- To recognize need and trends of Industry 4.0.
- To understand concepts and technologies supporting Industry 4.0
- To explore challenges and industrial applications of Industry 4.0

COURSE OBJECTIVES:

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

CO1: Understand the basic concepts of Industry 4.0 and the other related fields (Understand)

CO2: Identify the smart devices required for Industry 4.0 (Apply)

CO3: Analyze the different smart platforms adopted for Industry 4.0 (Apply)

CO4: Recognize the data management principles and cloud computing for Industry 4.0 (Understand)

CO5: Implement the Industry 4.0 to solve engineering problems (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:**UNIT I INTRODUCTION**

9

Various Industrial Revolutions, Digitalization and the Networked Economy, Digital twin - Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation, Lean Production Systems, Additive manufacturing, Robotization and automation, Current situation of Industry 4.0.

UNIT II SMART DEVICES IN INDUSTRY 4.0

9

Sensing & actuation, Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services, Smart Manufacturing, Smart Devices and Products, Smart Logistics, Predictive Analytics

UNIT III SMART PLATFORMS IN INDUSTRY 4.0

9

Cyberphysical Systems, Robotic Automation and Collaborative Robots, Support System for Industry 4.0, Cyber Security, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis

UNIT IV DATA MANAGEMENT AND CLOUD COMPUTING

9

Resource - based view of a firm, Data as a new resource for organizations, Harnessing and sharing knowledge in organizations, Cloud Computing Basics, Cloud Computing and Industry 4.0

UNIT V CHALLENGES AND INDUSTRIAL APPLICATIONS

Industry 4.0 laboratories, IIoT case studies, Application Domains, Business Issues, Opportunities and Challenges, Strategies for competing in an Industry 4.0 world. Introduction to Industry 4.0 to Industry 5.0 Advances.

Contact Periods:

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

TEXTBOOKS:

1. Gilchrist, A, "Industry 4.0: the industrial internet of things", 1st Edition, Apress Publishers, New York, 2016.
2. Schwab, K, "The fourth industrial revolution", 1st Edition, Portfolio Penguin Publishers, United Kingdom, 2017.

REFERENCES:

1. Garbie, I, "Sustainability in manufacturing enterprises: Concepts, analyses and assessments for industry 4.0", 1st Edition, Springer International Publishing, Switzerland, 2016.
2. Sudip Misra , Chandana Roy and Anandarup Mukherjee, "Introduction to Industrial Internet of Things and Industry 4.0", 1st Edition, CRC Press, New Delhi, India, 2020.

EVALUATION PATTERN:

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

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



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DEPARTMENT OF PHYSICS

SEMESTER VII

U21PHX02	ADVANCED MATERIALS SCIENCE FOR ENGINEERS	Category: OEC				
L	T	P	J	C		
3	0	0	0	3		

PRE-REQUISITES:

- Nil

COURSE OBJECTIVES

- To understand and learn about advanced materials and its preparation methods.
- To learn materials characterization methods.
- To study the properties and applications of different materials.

COURSE OUTCOMES

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

- CO1: Explain various types of materials and their properties (Understand)
- CO2: Carry out the various methods of materials synthesis (Understand)
- CO3: Analyse the structure and morphology of materials (Understand)
- CO4: Examine thermal, optical and magnetic behaviours using various techniques (Understand)
- CO5: Acquire knowledge on the potential applications of materials (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		
CO	3	2	0.8	1.6	0.2	-	0.2	0.6	1.2	1	-	1		
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SYLLABUS:

UNIT I MATERIALS AND THEIR PROPERTIES

9

Introduction – Classification of materials – Metals, ceramics, polymers, composites, advanced materials – Materials of the future (Carbon waste materials, MXene, metal organic framework (MOF), layered double hydroxide (LDH)) – Smart materials (piezo, pyro)

UNIT II SYNTHESIS OF MATERIALS

9

Ceramic – Sol-gel – Combustion – Coprecipitation – Electrochemical – Hydrothermal – Physical and chemical vapour deposition

UNIT III MATERIALS CHARACTERIZATION I

9

Principle, theory, working and application of X-ray diffraction (XRD), Electron microscopy (SEM, TEM) – Atomic force microscopy (AFM) – X-ray photo electron spectroscopy (XPS), Thermogravimetric and differential thermal analysis(TG-DTA)

UNIT IV MATERIALS CHARACTERIZATION II

9

UV visible spectroscopy (UV) – Fourier transform infrared spectroscopy (FTIR), Photoluminescence spectroscopy(PL), Raman spectroscopy – Vibrating sample magnetometer (VSM) and Electrochemical measurements, Lab and field visits

UNIT V APPLICATIONS OF MATERIALS

9

Materials for biomedical applications – Environmental nanotechnology – Materials for energy storage – Batteries – Fuel cells – Super capacitors – Thermoelectric generators – Solar energy harvesting

Contact Periods:

Lecture: 45 Periods Tutorial: - 0 Periods Practical: - Periods Project: - Periods
 Total: 45 Periods

TEXT BOOKS

- West A.R, "Solid state chemistry and its applications", 2nd Edition, Wiley, 2014
- Sam Zhang, Lin Li and Ashok Kumar, "Materials characterization techniques", CRC press, 2008
- Surender Kumar Sharma., "Handbook of Materials Characterization", Springer International, ISBN: 978-3-319-92955-2, (2019) 1-613

REFERENCES

- Rao C.N. R., "Chemical synthesis of solid inorganic materials", Critical review, Materials Science and Engineering B, 18 (1993) 1-21
- Verger, Louisiane, Varun Natu, Michael Carey, and Michel W. Barsoum. "MXenes: an introduction of their synthesis, select properties, and applications", Trends in chemistry 1, no. 7 (2019): 656-669
- Chakraborty, Gouri, In-Hyeok Park, Raghavender Medishetty, and Jagadese J. Vittal. "Two-dimensional metal-organic framework materials: Synthesis, structures, properties and applications", Chemical Reviews 121, no. 7 (2021): 3751-3891
- https://nptel.ac.in/courses/118/102/118102003/
- https://nptel.ac.in/courses/113/106/113106069/

EVALUATION PATTERN:

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


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Professor and Head

Department of Physics

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**DEPARTMENT OF CHEMISTRY
SEMESTER V**

U21CYX05	WASTE MANAGEMENT AND RESOURCE RECOVERY	Category: OEC
		L T P J C
		3 0 0 0 3

PRE-REQUISITES:

- NIL

COURSE OBJECTIVES:

- To provide fundamentals of solid waste collection, storage and management.
- To explain the solid waste processing, treatment technologies and integrated waste management.
- To summarize the principles of resource recovery and recycling.

COURSE OUTCOMES:

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

- CO1:** Explain the impact of solid waste on environment and its management frameworks. (Understand)
- CO2:** Solve the solid waste collection, transportation and storage issues through innovative approaches. (Apply)
- CO3:** Find the design and operation of various solid waste management technologies. (Apply)
- CO4:** Apply the principles of resource recovery and recycling for the sustainable management of waste. (Apply)
- CO5:** Summarize the importance of sanitary landfill and integrated waste management to ensure environmental safety. (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:**UNIT I FUNDAMENTALS OF SOLID WASTE MANAGEMENT**

9

Introduction to solid waste – definition, types – municipal, industrial, biomedical, e-waste, hazardous – Sources and composition of solid wastes – Factors influencing waste generation and estimation – Impact of improper waste management on environment, health, and infrastructure – Sustainable waste management principles and hierarchy – Indian and international waste management regulations and frameworks (SWM Rules 2016, CPCB guidelines)

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Professor & Head
Department of Chemistry
KPR Institute of Engineering and Technology

UNIT II COLLECTION, TRANSPORTATION, AND STORAGE

Waste collection methods (door-to-door, community bin, curbside) and systems (primary, secondary, manual, mechanical, integration) – Design and operation of collection routes – Storage containers – types, sizing, and placement – Waste transportation – vehicles, logistics, and optimization – Transfer stations – design and function – Innovative waste collection technologies – smart bins, RFID tracking, IoT-enabled systems

UNIT III PROCESSING AND TREATMENT TECHNOLOGIES

Mechanical processing – shredding, screening, baling – Biological treatment – composting, vermicomposting, anaerobic digestion – design and operation – Thermal treatment – incineration, pyrolysis, gasification – working principles and emissions control – Chemical treatment – stabilization, neutralization, disinfection – Leachate and odour control mechanisms – Comparison of low- and high-cost tech treatment solutions

UNIT IV RESOURCE RECOVERY AND RECYCLING

Principles of 3R (Reduce, Reuse, Recycle) – Material recovery facilities (MRF) – types, design and function – Recovery of paper, plastic, glass, metals, and e-waste – Energy recovery from waste – RDF, biogas, and waste-to-energy plants – Life cycle assessment and economics of recycling systems – Material recovery technologies – optical sorting, eddy current – AI-based systems – Green products and circular economy concepts

UNIT V LANDFILLING AND INTEGRATED WASTE MANAGEMENT

Sanitary landfill – site selection, design, liner systems, gas and leachate collection – Post-closure care and environmental monitoring – Integrated Solid Waste Management (ISWM) – concept and planning – Public awareness and participation in waste management – Environmental impact assessment (EIA) for landfill projects – Case studies of successful waste management systems in India

Contact Periods:

Lecture: 45 hours	Tutorial: - Hours	Practical: - Hours	Project: - Hours
			Total: 45 Hours

TEXT BOOKS:

1. G. Tchobanoglous, H. Theisen and S. A. Vigil, "Integrated Solid Waste Management: Engineering Principles and Management Issues", 1st Edition, McGraw Hill, 1993
2. M. Doble, K. Rollins, A. Kumar, "Green Chemistry and Engineering", 1st Edition, Academic Press, 2007
3. P. A. Vesilind, W. A. Worrell and D. R. Reinhart, "Solid Waste Engineering", 1st Edition, Cengage Learning, 2007
4. C. R. Rhyner, L. J. Schwartz, R. B. Wenger and M. G. Kohrell, "Waste Management and Resource Recovery", CRC Press, 1995

REFERENCES:

1. CPHEEO Manual on Municipal Solid Waste Management, Government of India.
2. Selected IS Codes, CPCB Guidelines and NGT Case Laws.

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EVALUATION PATTERN:

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

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

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**DEPARTMENT OF CHEMISTRY
SEMESTER VII**

U21CYX06	CHEMICAL ASPECTS OF FOOD ADULTERATION	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- NIL

COURSE OBJECTIVES:

- To provide chemical characteristics of food nutrients and impact of processing on major nutrients and vitamin content of food.
- To discuss about common adulterants in different foods and detection of food adulterants.
- To create awareness on food borne diseases, food poisoning and aspects of food safety.

COURSE OUTCOMES:

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

- CO1:** Explain chemical characteristics of food nutrients and impact of processing on major nutrients. (Understand)
- CO2:** Describe various types of food adulterations and permissible food additives. (Understand)
- CO3:** Determine the common adulterants in food through different methods of analysis. (Apply)
- CO4:** Summarize the impact of microorganisms, contaminants and antibiotic residue leading to food poisoning. (Understand)
- CO5:** Explain the present regulations and procedures regarding food adulteration and consumer protection. (Understand)

CO-PO MAPPING:

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

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


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SYLLABUS:**UNIT I EFFECT OF PROCESSING ON MAJOR FOOD NUTRIENTS**

9

Chemical constituents, characteristics – nutritional role and metabolic aspects of water, carbohydrates, proteins, fats, fibre, vitamins and minerals – Anti-nutritional factors of natural origin –Effect of processing on major nutrients and vitamin content of food – Natural pigments – chlorophylls, anthocyanin, carotenoids and curcumin – their structural composition and application in food industry

UNIT II FOOD ADULTERATION

9

Food adulteration – definition, types – Types of adulterants – intentional and incidental adulterants –poisonous substances, foreign matter, cheap substitutes, spoiled parts – Adulteration through food additives – intentional and incidental
Common food Additives – Organic acids, esters, alcohol, wood smoke – Legal aspects

UNIT III DETECTION OF COMMON FOOD ADULTERANTS

9

Common adulterants in different foods and theoretical aspects of detection of common food adulterants in – spices, grains, coffee, tea, oil/fats, food colours and Milk
Seminars on related/current food related issues (not from the syllabus)

UNIT V FOOD BORNE DISEASES AND FOOD POISONING

9

Food hazard – definition, types, general impact on Human Health – Food poisoning – types, prevention and control – Food borne diseases due to Bacterial, Viruses, Rickettsia, Mycotoxins, Parasites – Contaminants – Pesticide, insecticide, herbicide, fungicide, rodenticide – Antibiotic residue – toxic meal residue hormonal residue

UNIT V ASPECTS OF FOOD SAFETY

9

Concept of sanitation and hygienic production of food – Highlights of Food Safety and Standards Act 2006 (FSSA) – Food Safety and Standards Authority of India – Rules and Procedures of Local Authorities – Requirements and benefits of food grades and standard – BIS, AGMARK, ISI, FPO, CAC and FDA – Consumer's rights and responsibilities; COPRA 2019 – offenses and penalties, procedures to complain, compensation to victims.

Contact Periods:

Lecture: 45 Periods	Tutorial: - Periods	Practical: - Periods	Project: - Periods	Total: 45 Periods
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TEXT BOOKS:

1. W. W. Harvey, "Foods and Their Adulteration", 1st Edition, Book on Demand Ltd, 2013
2. E. M. Bruce, "Detection of the Common Food Adulterants", Alpha Edition, 2021
3. J. P. Battershall, "Food Adulteration and Its Detection", 1st Edition, Nabu Press, 2011
4. R. J. Marshall, "Food Safety: A Practical and Case Study Approach", 1st Editio, Springer-Verlag New York Inc., 2007
5. E. S. West, W. R. Todd, H. S. Mason, J. vanBruggen, "Textbook of Biochemistry", 4th Edition, Oxford and IBH Publishing Co. Pvt. Ltd,

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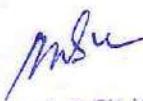
REFERENCES:

1. A. Y. Sathe, "A First Course in Food Analysis", 1st Edition, New Age International Pvt Ltd., 1999
2. N. J. Shyam, "Rapid Detection of Food Adulterants and Contaminants: Theory and Practice", 1st Edition, Academic Press Inc, 2016
3. Bare ACT, "Food Safety and Standards Act", 2006, 1st Edition, Commercial Law Publishers (India) Pvt. Ltd, 2021.
4. B. Sivasankar, "Food Processing and Preservation", 1st Edition, Prentice Hall India Learning Pvt Ltd., 2022
5. W. C. Frazier and D.C. Westhoff, "Food Microbiology", 5th Edition, Tata McGraw Hill Publishers, 2014
6. F. P. Antia, Clinical Dietetics and Nutrition, 4th Edition, Oxford university press, 1997.

EVALUATION PATTERN:

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				100	

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CENTRE FOR INNOVATION, INCUBATION AND ENTREPRENEURSHIP

SEMESTER VII

U21CAX02	INNOVATION AND PRODUCT DEVELOPMENT	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE-REQUISITES:

- NIL

COURSE OBJECTIVES:

- To impart knowledge on the fundamentals of innovation
- To expose the students to the product development process
- To create awareness on the customers expectation towards a product

COURSE OUTCOMES:

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

CO1: Explain the concept, process of innovation and idea generation - Understand

CO2: Discuss the attributes of innovation and its evaluation process - Understand

CO3: Describe the methodology for product development - Understand

CO4: Assess the customer requirements in product design - Apply

CO5: Apply structural approach to concept generation, selection and testing - Apply

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INNOVATION AND IDEA GENERATION

9

Concept of innovation- Comparative study on innovation and invention - Reasons for innovation – Process of innovation – How to build organizations for executing innovation- Process of idea generation – Methods for discovering opportunities – Organizational features that facilitate innovation – Building a learning organization

UNIT II INNOVATION ATTRIBUTES AND EVALUATION

9

Lead Users – Strategies for Leveraging user innovation- creating new products – Key attributes of innovation- Innovation Diffusion- Rate of adoption of an innovation – Innovation activities of business entities -Measurement of Innovation - Types of evaluation – Innovation Indicator

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UNIT III PRODUCT DEVELOPMENT AND PROCESSES

9

Introduction to Product development – Characteristics of successful product development – Design and development of products–Duration and cost of product development–Generic development process – Concept development – Front end process – Adopting the generic product development process

UNIT IV PRODUCT PLANNING AND CUSTOMER NEEDS

9

Evaluation and prioritize projects–Allocate resources and plan timing – Complete pre project planning Gather raw data from customer–Interpret raw data in terms of customer needs–Organize the needs into a hierarchy – Establish the relative importance of the product.

UNIT V CONCEPT GENERATION, AND TESTING

9

Activities of concept generation – Need for system level thinking – TRIZ and its comparison with brainstorming and lateral thinking – TRIZ tools Use of 40 principles to solve contradiction - Concept Testing: Purpose of concept test – Choose a survey population – Choose a survey format – Communicate the concept – measure customer response – Interpret the result – Reflect on the results and the process – Failure mode effect analysis

Contact Periods:

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

TEXT BOOKS:

1. Vinnie Jauhari and Sudhanshu Bhushan, "Innovation Management", Oxford University Press, 2014.
2. Karl.T.Ulrich and Steven D Eppinger Irwin, "Product Design and Development", 5th Edition, McGraw- Hill, 2011.

REFERENCES:

1. Kari T.Ulrich and Steven D.Eppinger, "Product Design and Development", McGraw-Hill International Edns. 1999.
2. Anita Goyal, Karl T Ulrich, Steven D Eppinger, "Product Design and Development ", 4th Edition, Tata McGraw-Hill Education, 2009.
3. Altshuller G, Altov H, Lev Shulyak, "And Suddenly the Inventor Appeared: TRIZ, The theory of Inventive Problem Solving", Technical Innovation Centre, 2nd Edition, May 1996.

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