# VII Semester – Open Electives Syllabi

# B.E. / B.Tech. Programme

# Regulations - 2021

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REGULATIONS 2021

B.E. / B.Tech. Programme

VII SEMESTER – OPEN ELECTIVES

SYLLABI

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

| **DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING** |
|---|---|---|
| **SL. NO.** | **COURSE CODE** | **COURSE TITLE** |
| 1. | U21EEX06 | Solar PV System: Installation and Maintenance |
| 2. | U21EEX07 | Optimization Techniques for Engineering Applications |

| **DEPARTEMENT OF INFORMATION TECHNOLOGY** |
|---|---|---|
| **SL. NO.** | **COURSE CODE** | **COURSE TITLE** |
| 1. | U21ITX07 | Introduction to Computer Forensics |
| 2. | U21ITX08 | User Interface Design |

| **DEPARTMENT OF MECHANICAL ENGINEERING** |
|---|---|---|
| **SL. NO.** | **COURSE CODE** | **COURSE TITLE** |
| 1. | U21MEX07 | Product Design and Development |
| 2. | U21MEX08 | Industrial Automation |

| **DEPARTMENT OF MECHATRONICS ENGINEERING** |
|---|---|---|
| **SL.NO.** | **COURSE CODE** | **COURSE TITLE** |
| 1. | U21MIX08 | Cyber Physical Systems |
| 2. | U21MIX09 | Introduction to Industry 4.0 |

| **SCIENCE AND HUMANITIES** |
|---|---|---|
| **SL. NO.** | **COURSE CODE** | **COURSE TITLE** |
| 1. | U21PHX02 | Advanced Materials Science for Engineers |

| **CENTRE FOR INNOVATION, INCUBATION AND ENTREPRENEURSHIP** |
|---|---|---|
| **SL. NO.** | **COURSE CODE** | **COURSE TITLE** |
| 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

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

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

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## DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

### SEMESTER VII

| | | Category: OEC | | | | |
|---|---|---|---|---|---|---|
| | | L | T | P | J | C |
| U21ADX07 | DATA MINING: CONCEPTS AND TECHNIQUES | 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

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**EVALUATION PATTERN:**

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

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. 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 – Plethsymography – 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

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**UNIT IV    PATIENT CARE AND MONITORING**                    9

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

**UNIT V    ELECTRICAL SAFETY OF BIOMEDICAL EQUIPMENT**        9

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

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

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## DEPARTMENT OF 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:** Asses 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**                                                9

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

**UNIT V     BURNS AND INJURIES OF BONES, JOINTS AND MUSCLES**      9

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

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

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## DEPARTMENT OF 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 bodes 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 | PSO1 | 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

9

## UNIT III    QUALITY CONTROL

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

9

## UNIT IV    REGULATIONS

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)

9

## UNIT V    REGULATORY COMMITTEES

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
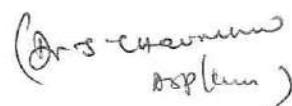
## REFERENCES:

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 | | | | | 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.

| 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
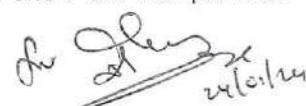
**REFERENCES:**

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 | | | | | 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.

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER VII

| 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 emphasis 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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Arasur, Coimbatore-641407

**UNIT III     COMFORTS IN BUILDING**                                    9

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 Passive 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 Sullage Water and 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 | | | | | End Semester Examinations |
|---|---|---|---|---|---|
| Assessment I (100 Marks) | | Assessment II (100 Marks) | | Total Internal Assessments | |
| *Individual Assignment / Case Study / Seminar / Project / MCQ | Written Test | *Individual Assignment / Case Study / Seminar / Project / MCQ | Written Test | | |
| 40 | 60 | 40 | 60 | 200 | 100 |
| Total | | | | 40 | 60 |
| | | | | 100 | |

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

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 Warming 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

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**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     9
MANAGEMENT**

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

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course 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

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## 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:

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

### REFERENCES:

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

### EVALUATION PATTERN:

| Continuous Internal Assessments | | | | | End Semester Examinations |
|---|---|---|---|---|---|
| Assessment I (100 Marks) | | Assessment II (100 Marks) | | Total Internal Assessments | |
| *Individual Assignment / Case Study / Seminar / 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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KPR Institute of Engineering and Technology
Coimbatore - 641 407

KPRIET
Learn Beyond

SEMESTER VII

| | | Category: OEC | | | | |
|---|---|---|---|---|---|---|
| U21CSX07 | FOUNDATIONS OF MULTIMEDIA AND ANIMATIONS | 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 | 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

**KPRIET**
Learn Beyond

### 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
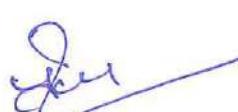
**REFERENCES:**

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 | | | | | 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.

**Head of the Department**
**Department of Computer Science and Engineering**
**KPR Institute of Engineering and Technology**
**Coimbatore - 641 407**

## 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:

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

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## EVALUATION PATTERN:

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

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Institute of Engineering and Technology

## DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

### SEMESTER VII

| | | Category: OEC | | | | |
|---|---|---|---|---|---|---|
| U21CBX07 | FINTECH REGULATIONS | 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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## 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.

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**EVALUATION PATTERN:**

| Continuous Internal Assessments | | | | Total Internal Assessments | End Semester Examinations |
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| Total | | | | 40 | 60 |
| | | | | 100 | |

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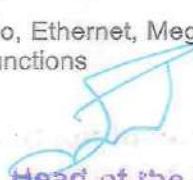
Definition and characteristics – Physical design – Logical design – IoT enabling technologies – IoT levels and deployment templates – IoT architecture – Domain specific IoTs – Environment, industry, health and life style

**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 | | | | | End Semester Examinations |
|---|---|---|---|---|---|
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| 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 | 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

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### 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 | |
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| | | | | 100 | |

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER VII

| U21EEX06 | 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
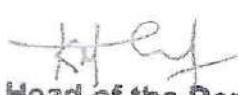
Basics of renewable energy sources – Energy scenario – Impact of solar energy on environment – Benefits and limitations of solar power – Solar PV system scenario in international and India

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:**

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

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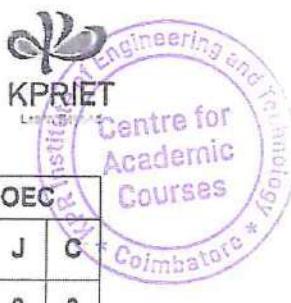
1. Yogi Goswami D, Frank Kreith and Jan F. Kreider, "Principles of Solar Engineering", 2nd edition, Taylor and Francis, 2003
2. Miguel A. Sanz-Bobi, "Use, Operation and Maintenance of Renewable Energy Systems Experiences and Future Approaches", 1st edition, Springer, 2016
3. Architectural Energy Corporation,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

**EVALUATION PATTERN:**

| Continuous Internal Assessments | | | | | End Semester Examinations |
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER VII

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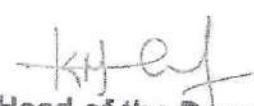
Optimization and Terminology – Concepts and Definitions – Statement of an optimization problem – Problem formulation: Objectives – Constraints – Classification – Function of one and multiple variables – Derivative based optimization – MATLAB Programming

**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

9

## UNIT IV    CONSTRAINED OPTIMIZATION TECHNIQUES

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

9

## 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
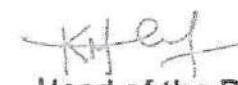
**REFERENCES:**

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:**

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## DEPARTMENT OF INFORMATION TECHNOLOGY

### SEMESTER VII

| 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 proccess of online intestigations
- 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.

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**UNIT III    ONLINE INVESTIGATIONS**                                                        9

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

**UNIT IV    NETWORK AND MOBILE FORENSICS**                                           9

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**                                          9

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 | | | | | 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 Designer can choose any one / two components based on the nature of the course.

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## 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

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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'Relliy, 2020.
2. Elizabeth Rosenzweig, "Successful User Experience: Strategies and Roadmaps", 2nd edition, Morgan Kaufmann Publishers In, 2020.

## EVALUATION PATTERN:

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

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

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## DEPARTMENT OF MECHANICAL ENGINEERING

### SEMESTER 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 in 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<br>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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Learn Beyond

## UNIT III    PRODUCT ARCHITECTURE                                                9

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

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

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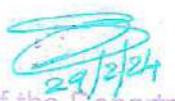
Automation in production systems – Principles and strategies – Elements, functions – Product production relationships – Manufacturing economics; Evolution of industrial automation – 2.0, 3.0 and 4.0, automated systems – Elements – Functions and levels; sensors and actuators in automation

### 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

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

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

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Arasur, Coimbatore - 641407.

DEPARTMENT OF MECHATRONICS ENGINEERING

SEMESTER VII

| 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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9

## 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.

9

## 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:

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

## REFERENCES:

1. Rajeev Alu, "Principles of Cyber-Physical Systems", MIT Press, United Kingdom, 2016.
2. 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 | | | | | End Semester Examinations |
|---|---|---|---|---|---|
| Assessment I (100 Marks) | | Assessment II (100 Marks) | | Total Internal Assessments | |
| *Individual Assignment / Case Study / Seminar / Project / MCQ | Written Test | *Individual Assignment / Case Study / Seminar / Project / MCQ | Written Test | | |
| 40 | 60 | 40 | 60 | 200 | 100 |
| Total | | | | 40 | 60 |
| | | | | 100 | |

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

Head of the Department
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Avinashi Road, Arasur, Coimbatore - 641407
Tamilnadu, India

## DEPARTMENT OF MECHATRONICS ENGINEERING

### SEMESTER VII

| 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 IFndustry 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

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Tamilnadu, India

## 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 | | | | | End Semester Examinations |
|---|---|---|---|---|---|
| Assessment I (100 Marks) | | Assessment II (100 Marks) | | Total Internal Assessments | |
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| 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, MXen, 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

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Professor and Head
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### 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**

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

**REFERENCES**

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

**EVALUATION PATTERN:**

| Continuous Internal Assessments | | | | | End Semester Examinations |
|---|---|---|---|---|---|
| Assessment I (100 Marks) | | Assessment II (100 Marks) | | Total Internal Assessments | |
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| 40 | 60 | 40 | 60 | 200 | 100 |
| Total | | | | 40 | 60 |
| | | | | 100 | |

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

## 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

Head-CIiED

**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.
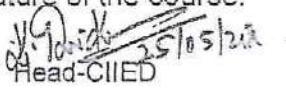
**REFERENCES:**

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.

**EVALUATION PATTERN:**

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# KPR Institute of Engineering and Technology

**Learn Beyond**

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