KPR Institute of Engineering and Technology

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(Autonomous, NAAC "A")

Avinashi Road, Arasur, Coimbatore.

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V Semester – Open Electives Syllabi

B.E. / B.Tech. Programme

Regulations - 2021

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REGULATION 2021

B.E. / B.Tech. Programme

V Semester – OPEN ELECTIVES

SYLLABI

SL. NO.	COURSE CODE	COURSE TITLE
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE		
1	U21ADX03	Artificial Intelligence: Principles and Techniques
2	U21ADX04	Ethics and Data Science
DEPARTMENT OF BIOMEDICAL ENGINEERING		
1	U21BMX03	Biomedical Visualization
2	U21BMX04	Food as Medicine
DEPARTMENT OF CIVIL ENGINEERING		
1	U21CEX03	Remote Sensing and GIS
2	U21CEX04	Waste Management
DEPARTMENT OF CHEMICAL ENGINEERING		
1	U21CHX03	Environmental Impact Assessment
2	U21CHX04	Industrial Wastewater Treatment
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING		
1	U21CSX03	Computational Thinking
2	U21CSX04	Blockchain Fundamentals
DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS		
1	U21CBX03	IT for Managers
2	U21CBX04	Security Analysis and Portfolio Management
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI&ML)		
1	U21AMX02	AI Fundamentals
2	U21AMX03	Joy of Programming

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DEPARTMENT OF INFORMATION TECHNOLOGY		
1	U21ITX03	Digital Transformation
2	U21ITX04	Human Resource Management
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING		
1	U21ECX03	Arduino Programming
2	U21ECX04	E-Waste Management
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING		
1	U21EEX03	Energy Technology
2	U21EEX04	Home Automation
DEPARTMENT OF MECHANICAL ENGINEERING		
1	U21MEX03	Industrial Safety
2	U21MEX04	Additive Manufacturing and 3D printing
DEPARTMENT OF MECHATRONICS ENGINEERING		
1	U21MIX03	MEMS & NEMS
2	U21MIX04	Robotics Process Automation
SCIENCE & HUMANITIES		
1	U21MAX01	Mathematical Modelling and Simulation
CENTRE FOR INNOVATION, INCUBATION AND ENTREPRENEURSHIP DEVELOPMENT		
1	U21CAX01	Entrepreneurship Development and Startup

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21ADX03	ARTIFICIAL INTELLIGENCE: PRINCIPLES AND TECHNIQUES	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI

COURSE OUTCOMES:

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

CO1: Formulate a problem and build intelligent agents (Understand)

CO2: Apply appropriate searching techniques to solve a real-world problem (Apply)

CO3: Understand the problem and infer new knowledge using suitable knowledge representation schemes (Understand)

CO4: Explain planning and apply learning algorithms on real world problems (Understand)

CO5: Understand the advance techniques in Artificial Intelligence (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION 9

Introduction – Future of Artificial Intelligence – Characteristics of Intelligent Agents – Structure of Agents – Problem Solving Agents – Search Strategies: Uninformed – Informed

UNIT II PROBLEM SOLVING METHODS 9

Local Search Algorithms and Optimization Problems – Searching with Nondeterministic Actions – Searching with Partial Observations – Game Playing – Optimal Decisions in Games – Alpha - Beta Pruning – Stochastic Games.

UNIT III REPRESENTATION OF KNOWLEDGE 9

First Order Logic – Syntax and Semantics of First-Order Logic – Unification and Lifting – Forward Chaining – Backward Chaining – Knowledge Representation: Ontological Engineering – Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information.

UNIT IV PLANNING 9

Planning: Definition of Classical Planning – Algorithms for Planning as State-Space Search – Planning Graphs – Planning and Acting in the Real World: Time, Schedules, and Resources – Hierarchical Planning – Planning and Acting in Nondeterministic Domains – Multiagent Planning.

UNIT V APPLICATIONS 9

AI applications: Natural Language Processing – Robot – Perception.

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, 4th Edition, 2020.

REFERENCES:

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach(Computer Science)", Jones and Bartlett Publishers, Inc.; 1st Edition, 2008
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", 5th Edition, Springer, 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 V

		Category: OEC				
U21ADX04	ETHICS AND DATA SCIENCE	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the importance of Ethics in Data Science
- To learn the principles of Data Ethics
- To learn Ethical Practices in Data Science

COURSE OUTCOMES:

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

CO1: Describe professional ethics in Data Science (Understand)

CO2: Infer the norms promote the aims of research, such as knowledge, truth, and avoidance of error (Understand)

CO3: Illustrate the security and usability of data (Understand)

CO4: Utilize the evaluating models for bias and fairness (Understand)

CO5: Describe to secure the privacy, availability and integrity of data (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION AND PHILOSOPHICAL FRAMEWORKS FOR ASSESSING FAIRNESS **9**

Foundations of ethics – Early theories of fairness (Utilitarianism etc.) – Contemporary theories of fairness – Significance of ethics in data science – Ethics vs. law/compliance/public relations – Cultural relativism – "Professional" ethics in data science – Individuals vs. collectives.

UNIT II RESEARCH ETHICS **9**

Data driven research – Methods of collection of data – Different types of data – Qualitative and quantitative – Overview of ethical issues in data-driven organizations – Doing ethical data analysis – Responsible use of research data – Plagiarism – Fake data and fabrication of data – Creation of data base.

UNIT III DATA OWNERSHIP, PRIVACY AND ANONYMITY 9

Understanding the difference between data ownership – Data privacy and data anonymity – Understanding the idea behind data surveillance – Data privacy vs. data security.

UNIT IV ALGORITHMIC FAIRNESS 9

Discrimination and algorithms – Obscure and un-intentional bias displayed by the algorithms – Ethics of data scraping and storage – Mosaic data – Found data – Designed data.

UNIT V POLICIES ON DATA PROTECTION 9

EU's general data protection rules (GDPR) – Digital India policy – Personal data protection bill – 2019 ("PDP Bill") – Ethical issues on data privacy in context with India, case studies.

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. DJ Patil, Hilary Mason, and Mike Loukides "Ethics and Data Science", 1st Edition, O'Reilly Media Inc, 2018.
2. Michael J. Quinn "Ethics for the Information Age", 7th Edition, Pearson, 2016.

REFERENCES:

1. Kord Davis, "Ethics of Big Data: Balancing Risk and Innovation", 1st Edition, O'Reilly Media Inc, 2012.
2. Bill Franks, "97 Things About Ethics Everyone in Data Science Should Know", O'Reilly Media Inc, 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 BIOMEDICAL ENGINEERING

SEMESTER V

		Category: OEC				
U21BMX03	BIOMEDICAL VISUALIZATION	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand fundamental concepts of biomedical visualization
- To explain principles, image interpretation and visualization techniques of biomedical data
- To illustrate the significance of

COURSE OUTCOMES:

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

CO1: Understand the principles, scope and different techniques in biomedical visualization (Understand)

CO2: Infer the principles and interpret images from various medical imaging modalities (Understand)

CO3: Execute visualization techniques for biomedical data (Apply)

CO4: Implement interactive visualizations in the field of biomedicine (Apply)

CO5: Explain advancements in biomedical visualization (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION TO BIOMEDICAL VISUALIZATION 9

Definition and scope – 2D and 3D visualizations – Static and dynamic visualizations – Spatial and temporal visualizations – Interactive and immersive visualizations

UNIT II FUNDAMENTALS OF MEDICAL IMAGING 9

Principles and image interpretation of: X–ray – Magnetic Resonance Imaging – Computed Tomography scanning – Ultrasound imaging – Nuclear medicine imaging

UNIT III VISUALIZATION TECHNIQUES FOR BIOMEDICAL DATA 9

Exploratory Data Analysis (EDA) – Data preprocessing – Distribution analysis – Histogram visualization – Scatter plots – Correlation visualization

UNIT IV INTERACTIVE VISUALIZATION IN BIOMEDICINE 9

Human–computer interaction principles – Iterative development processes – Brushing – Linking – Interactive filtering – Query based exploration – Zooming – Panning – Case studies

UNIT V ADVANCEMENTS IN BIOMEDICAL VISUALIZATION 9

Virtual reality for preoperative planning and intraoperative guidance – Haptic feedback and tactile interactions in virtual environments – Super resolution microscopy – Ethical considerations in data visualization

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Julie Briley, ND & Courtney Jackson, ND, "Food As Medicine Everyday", NUNM Press, 2016
2. Daine Kraft, "The A–Z Guide to Food as Medicine" 2nd Edition, CRC Press, 2016

REFERENCES:

1. Kathleen Hefferon, "Let Thy Food Be Thy Medicine: Plants and Modern Medicine", Oxford University Press, Inc., 2012

EVALUATION PATTERN:

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

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

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SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21BMX04	FOOD AS MEDICINE	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand fundamental concepts of nutrients in foods
- To explain healthy eating and lifestyle habits
- To illustrate the role of food in promoting health and preventing disease, including dietary patterns and gut–brain connection

COURSE OUTCOMES:

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

CO1: Recall the fundamental concepts related to nutrients in foods (Remember)

CO2: Explain the key concepts related to healthy eating and lifestyle habits (Understand)

CO3: Illustrate role of medicinal herbs and spices in promoting health and preventing disease (Understand)

CO4: Interpret a dietary pattern based on the requirement of the individuals (Apply)

CO5: Summarize the connection between the gut and the brain, and how this relationship can impact mental and physical health (Understand)

CO–PO MAPPING:

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

SYLLABUS:

UNIT I NUTRIENTS AND HEALTH 9

Introduction — Nutrients in Foods and their sources – Pre- & Pro-biotics, Phytochemicals and Antioxidants in Foods – Metabolism

UNIT II HABITS FOR HEALTH 9

Body Mass Index – Benefits of Breakfast – Water – Guidelines for calorie intake – Strategies for healthy digestion – Balancing blood sugar

UNIT III MEDICINAL VALUES OF FOOD 9

Medicinal herbs and spices – Importance of Dairy foods – Plant and Animal foods – Food to limit and avoid

UNIT IV DIET AND CHRONIC DIDEASES 9

The FAME plate – Dietary patterns to manage: cardiovascular diseases – diabetes – cancer – Malnutrition and obesity

UNIT V FOOD AND THE BRAIN 9

Food for seasons – Sustainable and Equitable food systems – Gut – Brain Connection – Addiction – Mindful Eating Technique – Culinary therapy

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Julie Briley, ND & Courtney Jackson, ND, "Food As Medicine Everyday", NUNM Press, 2016
2. Daine Kraft, " The A–Z Guide to Food as Medicine" 2nd Edition, CRC Press, 2016

REFERENCES:

1. Kathleen Hefferon, "Let Thy Food Be Thy Medicine: Plants and Modern Medicine", Oxford University Press, Inc., 2012

EVALUATION PATTERN:

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

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

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DEPARTMENT OF CIVIL ENGINEERING

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21CEX03	REMOTE SENSING & GIS	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To give an overview about the basic concepts and principles of various components of remote sensing
- To introduce the different components of GIS and about map projection and coordinate system
- To provide details of spatial structures

COURSE OUTCOMES:

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

CO1: Select the type of remote sensing technique or data for required purpose (Understand)

CO2: Identify the earth surface features from satellite images (Understand)

CO3: Classify the maps, coordinate systems and projections (Understand)

CO4: Explain the GIS data structures and data models (Understand)

CO5: Make use of spatial and attribute data and study the errors in maps (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I REMOTE SENSING SYSTEM 9

Elements of EMR – Wavelength regions – Energy interaction in atmosphere – Absorption – Scattering – Atmospheric windows – Terrestrial interaction – Spectral reflectance curves – Active and passive remote sensing – Types of platforms – Orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors – Types of resolutions – Plank's blackbody law – Displacement law and emissivity effects

UNIT II SATELLITE DATA PRODUCT AND INTERPRETATION OF SATELLITE IMAGERIES 9

Types of data product – Software and hardware requirement for data processing – Elements of visual image interpretation – Digital Image processing techniques, Landuse / landcover

classification

UNIT III GEOGRAPHIC INFORMATION SYSTEMS 9

Map and map scale – Types of map, Digital Cartography and Evolution of GIS, Components of GIS – Coordinate system – Map projection – Datums, ellipsoids, geoids, Type of data – spatial and non-spatial data, various sources of data – Georeferencing

UNIT IV SPATIAL DBMS 9

Introduction, data storage, database structures – data models – spatial data models – Raster Data Structures – Raster Data Compression – Vector Data Structures – Raster vs Vector Models – TIN and GRID data models

UNIT V DATA INPUT AND OUTPUT 9

Scanner - Raster Data Input – Raster Data File Formats - Vector Data Input – Digitiser – Raster and Vector overlay method – Reclass, Recode, Types of output data, Map layout, source of errors, types of errors, elimination, accuracies – Introduction to web GIS – OGC and web services – Multimedia GIS – 3D GIS – Data quality and standards – Applications of GIS and RS

Contact Periods:

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

TEXT BOOKS:

1. Chang K. T., "Introduction to Geographical Information Systems", Tata McGraw Hill, 1st edition, 2015
2. Jensen, John R., "Remote Sensing of the Environment", An Earth Resource Perspective, 2nd edition, Prentice Hall, New Jersey, 2013

REFERENCES:

1. Prescott, Harley and Klein, "Microbiology", 10th edition, McGraw Hill, 2017

EVALUATION PATTERN:

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

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

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DEPARTMENT OF CIVIL ENGINEERING

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21CEX04	WASTE MANAGEMENT	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the solid waste management, recent trends in global solid waste processing
- To demonstrate the recent technologies, in handling of the wastes such as hazardous, biomedical, electronic waste
- To explain the wastewater management and its treatment processes

COURSE OUTCOMES:

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

CO1: Demonstrate the municipal solid waste management (Understand)

CO2: Infer on hazardous waste management (Understand)

CO3: Outline on biomedical waste management (Understand)

CO4: Illustrate the management of E–waste (Understand)

CO5: Summarize the management on wastewater (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I MUNICIPAL SOLID WASTE MANAGEMENT 9

Municipal solid wastes – Introduction, sources and characteristics – Generation – Collection – Transport – Treatment – Disposal in landfills – Leachate – Solid waste impact on environment and human health – Recent trends in global solid waste processing technologies – Solid waste handling rules

UNIT II HAZARDOUS WASTES 9

Hazardous wastes – Introduction, sources and characteristics – Generation – Collection – Transport – Treatment and disposal – Legislation on management – Handling of hazardous wastes

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UNIT III BIOMEDICAL WASTE 9

Biomedical wastes – Introduction, Sources – Characterization – Types – Impact of biomedical waste on environment – Global scenario – Methods of treatment and disposal – Ethical aspects and legal implications

UNIT IV ELECTRONIC WASTE 9

Electronic wastes – Introduction, Sources – Characterization – Types – Impact of e–waste on environment – E-waste management – Control measures – Treatment and disposal system of e-waste

UNIT V WASTE WATER MANAGEMENT 9

Wastewater – Introduction, generation and characteristics – Effluent standards – Layout of sewage treatment plant – Sewage disposal – Sludge treatment and disposal – Recent advances

Contact Periods:

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

TEXT BOOKS:

1. Gerard Kiely, "Environmental Engineering", 2nd edition, McGraw Hill Education (India) Pvt Ltd., 2013
2. Sincero A. P and Sincero G. A, "Environmental Engineering", 1st edition, A Design Approach by Prentice Hall of India, 2014

REFERENCES:

1. Garg. S. K, "Environmental Engineering (Vol.II) Sewage disposal and Air Pollution Engineering", 2nd edition, Khanna Publishers, 2008
2. Peavy. H. S, Rowe. D.R, and Tchobanoglous. G, "Environmental Engineering", 3rd edition, McGraw–Hill international edition, 1985
3. Simeon Dulo Solid, "Waste Management", 1st edition, VDM Verlag publication, 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.

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DEPARTMENT OF CHEMICAL ENGINEERING

SEMESTER V

		Category: OEC				
U21CHX03	ENVIRONMENTAL IMPACT ASSESSMENT	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To impart the knowledge and skills to identify, assess and mitigate the environmental impacts
- To provide the knowledge of social impacts on development projects
- To know about the importance of environmental impact assessment

COURSE OUTCOMES:

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

CO1: Explain the concept of environmental impact assessment (Understand)

CO2: Gain knowledge on various components and assessment techniques of EIA (Understand)

CO3: Understand environmental management plan (Understand)

CO4: Elaborate socioeconomic assessment plans (Understand)

CO5: Apply the knowledge of EIA monitoring through various industrial exposure (Apply)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION **9**

Impacts of development on environment – Rio principles of sustainable development goals – Environmental Impact Assessment – Objectives – Historical development – Types – Notification – Legal frameworks

UNIT II ENVIRONEMNETAL ASESSMENT **9**

Screening and Scoping – Drafting of terms of reference – Baseline monitoring – Prediction and Assessment of Impact on land, water, air, noise – Matrices – Networks – Checklists methods.

UNIT III ENVIRONEMNTAL MANAGEMENT PLAN **9**

Plan for mitigation of adverse impact on land, water, air, noise – Environmental monitoring plan – EIA report preparation – Public hearing – Environmental clearance

UNIT IV SOCIO ECENOMIC ASSESSMENT 9

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

UNIT V MONITORING STUDIES AND APPLICATIONS 9

Environmental monitoring – Guidelines – Policies – Planning of monitoring programs – Environmental management plan – Post project audit – Case studies

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Daniel P. Lawrence, "Environmental Impact Assessment", 2nd edition, Wiley Blackwell, New Jersey, 2003
2. Anjaneyulu Y and Manickam V, "Environmental Impact Assessment Methodologies", 3rd edition, BS Publications, 2020

REFERENCES:

1. Henk A. Becker and Frank Vanclay, "The International Handbook of Social Impact Assessment", 2nd edition, Edward Elgar Publishing, United Kingdom, 2003
2. Judith Petts, "Handbook of Environmental Impact Assessment", Vol I and II, Blackwell Science Newyork, 1998

EVALUATION PATTERN:

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

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

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SEMESTER V

		Category: OEC				
U21CHX04	INDUSTRIAL WASTEWATER TREATMENT	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To know about the basics of biological water treatment methods
- To know about the applications of biological water treatment methods
- To understand about various equipment used in waste water treatment

COURSE OUTCOMES:

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

CO1: Understand the biochemical fundamentals and its application (Understand)

CO2: Analysis of modelling of ideal suspended growth reactors (Analyze)

CO3: Design and evaluation of suspended growth processes (Apply)

CO4: Analyse the modelling of ideal attached growth reactors (Analyze)

CO5: Apply the concepts of bioreactor for water treatment (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	1	-	1		
CO2	3	1	1	-	-	-	-	1	1	1	-	1		
CO3	3	1	1	-	-	-	-	1	1	1	-	1		
CO4	3	1	1	-	-	-	-	1	1	1	-	1		
CO5	3	1	1	1	-	-	-	-	1	1	-	1		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

SYLLABUS:

UNIT I INTRODUCTION TO BIOCHEMICAL OPERATIONS 9

Classification of biochemical operations – Fundamentals of biochemical operations

UNIT II TRADITIONAL BIOLOGICAL TREATMENT 9

Theory – Modelling of ideal suspended growth reactors – Modelling suspended growth systems – Aerobic growth of heterotrophy in a single continuous stirred tank reactor receiving soluble substrate – Multiple microbial activities in a single continuous stirred tank reactor

UNIT III APPLICATION OF TRADITIONAL BIOLOGICAL TREATMENT 9

Suspended growth reactors – Design and evaluation of suspended growth processes – Activated sludge – Biological nutrient removal – Aerobic digestion – Anaerobic processes – Lagoons

UNIT IV BIOREACTOTS FOR WATER TREATMENT **9**

Modelling of ideal attached growth reactors – Bio-film modeling – Aerobic growth of biomass in packed towers – Aerobic growth of heterotrophs in rotating disc reactors – Fluidized bed biological reactors

UNIT V APPLICATIONS OF BIOREACTORS FOR WATER TREATMENT **9**

Attached growth reactors – Tricking filter – Rotating biological contactor – Submerged attached growth bioreactors

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Grady Jr C L, Dalggar G T, Love N G and Fillpe C D, "Biological Wastewater Treatment", 1st edition, CRC Press, 2016
2. Patwardhan A D, "Industrial Wastewater Treatment", 1st edition, PHI Learning Pvt. Ltd, 2017

REFERENCES:

1. Andreoli C.V, Von Sperling M, and Fernandes F, Sludge treatment and disposal. 1st edition, IWA publishing, 2007
2. Nicholas P.C, "Handbook of Water and Wastewater Treatment Technologies", 1st edition, Press. USA, Boston, Washington, 2002

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 COMPUTER SCIENCE AND ENGINEERING

SEMESTER V

		Category: OEC				
U21CSX03	COMPUTATIONAL THINKING	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To formulate problems in a way that enables the use of a computer to solve them
- To logically organize and analyze data using various techniques
- To identify, analyze and implement possible solutions with the goal of achieving the most efficient and effective combination of steps and resources

COURSE OUTCOMES:

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

CO1: Explain the basic principles of Computational thinking (Understand)
CO2: Examine the data organization and processing using Python (Apply)
CO3: Make use of the basic algorithm tracing techniques (Apply)
CO4: Employ the basics of an operating system, networking, database management system, API and XML (Apply)
CO5: Determine the efficiency of algorithms (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		
CO2	3	2	2	2	1	-	-	-	-	-	-	2		
CO3	3	2	2	2	1	-	-	-	-	-	-	2		
CO4	3	2	2	2	2	-	-	-	-	-	-	3		
CO5	3	2	3	1	-	-	-	-	-	-	-	3		
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SYLLABUS:

UNIT I PRINCIPLES OF COMPUTATIONAL THINKING 9

Programming – Algorithmic thinking – Bitwise and Boolean algebra – Compiler vs interpreter – Pseudo coding – Problem definition – Data collection – Problem decomposition – Abstraction – Flowcharting – Name binding – Selection – Repetition – Modularization – Sample exercise problems and deriving solutions

UNIT II DATA ORGANIZATION & PROCESSING USING PYTHON 9

Operators – Variables and Data types – Loops and conditions – Nested loop – Strings – Euclid's algorithm – Arrays – Functions – Recursion

UNIT III REVERSE ENGINEERING & SOLUTIONS 9

Algorithm Tracing Technique (simulating execution) – Best practices – keeping it simple – documentation style – idioms – DRY code – naming conventions – and comments – Debugging Anticipating output from pseudo code

UNIT IV APPLIED COMPUTATIONAL THINKING 9

Operating systems basics – Networking basics – Database Management System (DBMS) – SQL – No SQL – JSON – API – XML

UNIT V EFFICIENCY ANALYSIS AND BENCHMARKING 9

Algorithm efficiency – Time complexity in programs – Mathematical preliminaries – Asymptotic analysis – Recurrence relations – Algorithm design paradigms – Divide and conquer algorithms – Dynamic programming – and Greedy algorithms

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. David Riley and Kenny Hunt, "Computational thinking for the modern solver", 1st Edition, Chapman & Hall/CRC, 2014
2. Karl Beecher, "Computational Thinking: A beginner's guide to problem solving and programming", 1st Edition, BCS, The Chartered Institute for IT, 2017

REFERENCES:

1. Paul Curzon and Peter William Mcowan,"Power Of Computational Thinking, The: Games, Magic And Puzzles To Help You Become A Computational Thinker", Kindle Edition, World Scientific Publishing Europe Ltd, 2017
2. Fabrizio Luccio, Paolo Ferragina,"Computational Thinking: First Algorithms, Then Code", 1st Edition, Springer,2018
3. Jane Krauss, Kiki Prottsman,"Computational Thinking and Coding for Every Student: The Teacher"s Getting-Started Guide" 1st Edition, SAGE Publications, 2016

EVALUATION PATTERN:

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

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

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SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21CSX04	BLOCKCHAIN FUNDAMENTALS	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the history, types and applications of blockchain
- To acquire knowledge about cryptography and consensus algorithms
- To design and deploy blockchain based applications

COURSE OUTCOMES:

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

CO1: Discuss the foundations of blockchain technologies (Understand)
CO2: Outline the different blockchain consensus (Understand)
CO3: Describe the foundations of bitcoin and cryptocurrency (Understand)
CO4: Utilize the concepts of Ethereum and Hyperledger fabric (Apply)
CO5: Derive an appropriate solution to the given use cases (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		
CO2	2	1	1	1	-	-	-	-	-	-	-	2		
CO3	2	1	1	1	2	-	-	-	-	-	-	2		
CO4	3	2	2	2	2	-	-	-	-	-	-	3		
CO5	3	2	2	2	1	3	3	-	-	-	-	3		

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

SYLLABUS:

UNIT I INTRODUCTION TO BLOCKCHAIN 9

Introduction – Advantage over conventional distributed database – Blockchain Network – Mining Mechanism – Distributed Consensus – Merkle Patricia Tree – Transactions and Fee – Anonymity – Reward – Chain Policy – Private and Public blockchain

UNIT II BLOCKCHAIN 1.0 9

Blockchain Architecture – Block – Hash – Distributer P2P – Structure of Blockchain, – Nakamoto consensus – Proof of Work – Proof of Stake – Proof of Burn – Difficulty Level – Sybil Attack – Energy utilization and alternate

UNIT III BLOCKCHAIN 2.0 9

\ basic crypto currency – Creation of coins, Payments and double spending – FORTH – the recursor for Bitcoin scripting – Bitcoin Scripts – Bitcoin P2P Network – Transaction in Bitcoin etwork – Block Mining – Block propagation and block relay, Consensus introduction, Distributed

consensus in open environments-Consensus in a Bitcoin network

UNIT IV BLOCKCHAIN 3.0 **9**

Ethereum network – EVM – Transaction fee – Mist Browser – Ether – Gas – Solidity – smart contracts – Truffle Design and issue Crypto currency – Mining – DApps – DAO – Architecture of Hyperledger fabric v1.1 – Introduction to hyperledger fabric v1.1 – chain code

UNIT V USECASES OF BLOCKCHAIN **9**

Blockchain usecases in Financial sector – Business sector – Government & Public Sector – Healthcare Use Cases– IoT – Retail Fashion & sports and supply chain

Contact Periods:

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

TEXT BOOKS:

1. Bashir Imran, "Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks", 2nd Edition, Packt Publishinh Ltd, 2017
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, "Bitcoin and cryptocurrency technologies: a comprehensive introduction" 2nd Edition, Princeton University Press, 2016
3. Josh Thompson, "'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming", 1st Edition, Create Space Independent Publishing Platform, 2017

REFERENCES:

1. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Kindle Edition, Packt Publishing Limited, 2018
2. Andreas M. Antonopoulo, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", 1st Edition, O'Reilly Media Inc, 2015

EVALUATION PATTERN:

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

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

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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

SEMESTER - V

		Category: OEC				
		L	T	P	J	C
U21CBX03	IT FOR MANAGERS	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand how to apply IS concepts and components to meet the informational needs of managers
- To gain various IS development methodologies and innovative process models
- To know different types of IS and IT applications to business needs

COURSE OUTCOMES:

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

CO1: Describe the informational needs of managers and the components, types and characteristics of information systems (Understand)

CO2: Apply various IS development methodologies and innovative process models (Apply)

CO3: Evaluate transaction processing systems, decision support systems, and expert systems (Apply)

CO4: Utilize the applications of ERP, CRM, SCM, E-Commerce, and M-Commerce in business (Apply)

CO5: Identify the managerial issues in information systems management and identify the latest trends in MIS (Apply)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I FOUNDATIONS OF IS 9

Introduction to Information Systems– Informational needs of managers – Components of Information Systems viz – Hardware– Software – Database – Networks – Human Resources – Elements of IS – Characteristics of IS – Types of IS for managers – TPS – DSS – EIS

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UNIT II SDLC AND VARIOUS METHODS 9

Systems Development Life Cycle – Various methodologies of IS development – Agile and Continuous Delivery Models – Design and Implementation of Innovative Process models

UNIT III VARIOUS FORMS OF IS 9

Transaction Processing Systems – Decision Support Systems – GDSS– Executive Information Systems and Expert Systems

UNIT IV IS AND IT'S VARIOUS APPLICATIONS 9

IT applications in business–ERP– CRM– SCM – E-Commerce – M-Commerce

UNIT V MANAGERIAL ISSUES IN IS 9

Emerging issues in managing Information Systems in business – Systems Security – Technological obsolescence – Change Management – IT infrastructure Management – Latest Trends in Management Information system

Contact Periods:

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

Total : 45 Periods

TEXT BOOKS:

1. Maria Pomffyova, "Management of Information Systems", 4th Edition, IntechOpen, 2018
2. Ken J.Sousa, EffyOzz, "Management Information system", 7th Edition, Course Technology, 2014.

REFERENCES:

1. GeorgeM. Marakas, James A. O'Brien,"Introduction to Information systems",16th Edition, McGraw hill Education, 2012
2. A.P Goyal, "Management Information Systems", 4th Edition, Oxford University Press, 2014

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 - V

		Category: OEC				
		L	T	P	J	C
U21CBX04	SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To gain the evaluation of investment instruments and apply security valuation techniques
- To understand the fundamental and technical analysis for capital allocation
- To know the effective portfolio management strategies and to evaluate performance

COURSE OUTCOMES:

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

CO1: Describe investment instruments, risk, and returns and apply security valuation methods (Understand)

CO2: Compare and contrast fundamental and technical analysis techniques for security valuation and determine capital allocation (Understand)

CO3: Utilize the efficient market hypothesis in security analysis and portfolio management (Understand)

CO4: Construct efficient portfolios and value securities using portfolio theory and capital market Theory (Apply)

CO5: Implement portfolio management strategies and evaluate portfolio performance with quantitative metrics (Apply)

CO-PO MAPPING:

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

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

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KPRIET
Learn Beyond

SYLLABUS:

UNIT I INVESTMENT, RISK AND RETURN & VALUATION OF SECURITIES 9

Concepts of investment – Sources of investment information– Investment Instruments – Investment cycle – Concept of total risk – factors contributing to total risk – default risk – interest rate risk – market risk – management risk – purchasing power risk – systematic and unsystematic risk – Bond and fixed income – instruments valuation – valuation of equity and preference shares.

UNIT II FUNDAMENTAL AND TECHNICAL ANALYSIS 9

Concept of intrinsic value– Objectives and beliefs of fundamental analysts – Economy – Industry Company framework – Economic analysis and forecasting– Technical analysis – Points and figures chart– bar chart– RSA– RSI– Moving average analysis – MACD – Japanese Candlesticks – Capital allocation between risky and risk free assets – Utility analysis.

UNIT III EFFICIENT MARKET HYPOTHESIS 9

Market mechanism – testable hypothesis about market efficiency – implications of efficiency market hypothesis for security analysis and portfolio management.

UNIT IV PORTFOLIO THEORY AND CAPITAL MARKET THEORY 9

Markowitz portfolio theory– Risk and risk aversion – Efficient Frontier and Utility – Capital Market Theory – Capital Market Line (CML) & Separation Theorem – Market Portfolio –Security Market Line (SML) – Capital Asset Pricing Models – CAPM and Arbitrage pricing theories.

UNIT V PORTFOLIO MANAGEMENT STRATEGIES AND PERFORMANCE EVALUATION 9

Passive Vs Active management – Passive strategies and active strategies of Portfolio Management – Asset Allocation Strategies– Portfolio Evaluation Measures – Sharpe ratio– Treynor ratio and Jensen's Alpha – Portfolio monitoring and revision.

Contact Periods:

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

TEXT BOOKS:

1. Herbert B. Mayo, "Investments – An introduction", 12th Edition, Cengage Learning,2021.
2. Frank K. Reilly, Keith C. Brown, "Investment Analysis and Portfolio Management",10th Edition, Cengage Learning,2018.

REFERENCES:

1. ZviBodie, Alex Kane, Alan Marcus, Pitabas Mohanty, (2017), "Investments", 10th Edition, McGraw-Hill, 2017.
2. Prasanna Chandra, Investment Analysis and Portfolio Management, 5th Edition, McGraw Hill, 2017.

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Learn Beyond

EVALUATION PATTERN:

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

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

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KPRIET

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AIML)

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21AMX02	AI FUNDAMENTALS	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To provide students with a solid foundation in the basics of AI, machine learning, and deep learning
- To enable students to understand the potential applications of AI in various industries
- To provide students with hands-on experience in implementing machine learning algorithms and deep learning models
- To develop an understanding of ethical considerations around the development and implementation of AI

COURSE OUTCOMES:

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

CO1: Understand the basics of Artificial Intelligence (Understand)

CO2: Recognize the considerations of Machine Learning (Understand)

CO3: Learn Deep Learning and its libraries (Understand)

CO4: Interpret various Natural Language Processing models (Understand)

CO5: Understand the ethical considerations of AI on society (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION TO AI 9

Overview of AI – What is data – What makes an AI company – What machine learning can and cannot do – AI Applications – AI techniques – AI tools

UNIT II MACHINE LEARNING 9

Supervised learning – Unsupervised Learning – Reinforcement learning – Suitable demonstrations

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UNIT III DEEP LEARNING 9

Introduction – Neural Networks – Convolutional Neural Networks – Recurrent Neural Networks – Deep Learning libraries

UNIT IV NATURAL LANGUAGE PROCESSING 9

Introduction – Text pre-processing – Feature extraction – Sentiment analysis – Named entity recognition – Suitable demonstrations

UNIT V AI ETHICS 9

AI ethics overview – Ethical considerations in AI – Techniques for integrating ethical considerations in AI development – Social impacts of AI

Contact Periods:

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

Total: 45 Periods

TEXTBOOKS:

1. Prateek Joshi, "Artificial Intelligence with Python", 1st edition, Packt publishing, 2017
2. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 1st edition, O'Reilly Media, 2019

REFERENCES:

1. Jeff Heaton, "Artificial Intelligence for Humans: Fundamental Algorithms", 1st edition, Heaton Research Inc., 2013
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd edition, Pearson, 2009
3. Coursera course: https://www.coursera.org/learn/ai-for-everyone

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 anyone / two components based on the nature of the course.

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Learn Beyond

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AIML)

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21AMX03	JOY OF PROGRAMMING	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To introduce students to the basics of programming languages and paradigms
- To equip students with foundational knowledge in programming concepts such as variables, data types, and operator
- To promote effective communication skills by requiring students to present their programming solutions

COURSE OUTCOMES:

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

CO1: Understand the fundamentals python programming (Understand)

CO2: Describe object-oriented concepts using java (Understand)

CO3: Explain the knowledge of data structures and its algorithms (Understand)

CO4: Summarize database concepts, use of SQL for querying and manipulating data (Understand)

CO5: Interpret data science, data visualization and basics of machine learning (Understand)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I PROGRAMMING IN PYTHON 9

Overview of programming languages and paradigms – Basic concepts of programming: Variables, Data types, Operators, Expressions, and Statements – Control Structures

UNIT II OBJECT-ORIENTED PROGRAMMING USING JAVA 9

Basic concepts of object – Oriented programming: Objects, Classes, Inheritance, Polymorphism, Encapsulation, Abstraction, and Information hiding – Multi Threading – Exception Handling

22.6.23

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UNIT III DATA STRUCTURES AND ALGORITHMS 9

Concepts: Arrays – Linked lists – Stack and queue – Searching and sorting algorithms – Recursion and backtracking

UNIT IV DATABASES AND SQL 9

Basic concepts of databases – Database management systems – Introduction to SQL: Querying and manipulating data – Basic concepts of NoSQL databases

UNIT V INTRODUCTION TO DATA SCIENCE 9

Basic concepts of data science – Data analytics – Data visualization using python libraries – Matplotlib and Seaborn – Basic concepts of machine learning and predictive analytics

Contact Periods:

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

Total: 45 Periods

TEXTBOOKS:

1. Tony Gaddis, "Starting Out with Python", 4th edition, Pearson, 2019
2. Kathy Sierra and Bert Bates, "Head First Java", 2nd edition, O'Reilly Media, 2021
3. Carlos Coronel, Steven Morris, and Peter Rob, "Database Systems: Design, Implementation, and Management", 12th edition, Cengage Learning, 2016

REFERENCES:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", 1st edition, O'Reilly Media, 2015
2. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures and Algorithms in Java", 6th edition, Wiley, 2019

EVALUATION PATTERN:

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

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

22.6.23

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DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER V

		Category: OEC				
U21ITX03	DIGITAL TRANSFORMATION	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- NIL

COURSE OBJECTIVES:

- Understand the concept and importance of digital transformation.
- Engaging the students in projects and assignments that illustrate the various pillars of digital transformation.
- Understand with case studies the strategy and implementation of a digital transformation and marketing

COURSE OUTCOMES:

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

CO1: Understand core IT technologies and business models behind digital transformation (Understand)

CO2: Understand digital transformation in organizations perspective (Understand)

CO3: Redesigning, rebuilding organizations to create digital transformation (Understand)

CO4: Skills to incorporate disruption in business planning (Apply)

CO5: Determine the potential of technology advancements and the opportunities for revenue generation (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION 9

Digital Transformation, Digital business models, Pitfalls of digital transformation, Choosing business ideas , Domains of digital transformation

UNIT II EMPLOYEE AND TEAM DIGITAL READINESS 9

Employee digital readiness, Drivers of employee digital readiness, Consequences of employee digital readiness, Fostering digital readiness at the employee and team level, Four domains of digital business projects

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UNIT III DATA-DRIVEN DECISION MAKING 9

Benefits of data driven decision making, Example of data-driven decision-making, Practice data-driven decision-making in business , Wrapping up data-driven decision making

UNIT IV DEVELOPING DIGITAL REQUIREMENTS 9

Applying Product Thinking, Improving in Multiple Dimensions, Changing Requirements Mindset, Digital Tools , Case Studies: AB InBev, Walmart, Ford

UNIT V DIGITAL MARKETING AND E-COMMERCE 9

Active Websites and Blogs, Essentials of Email Marketing, Affiliate Marketing, Search engine optimization and search engine marketing, Electronic commerce, Trends in digital marketing, Case studies: Social media marketing, Startups

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Bob Black "Digital Transformation: A Guide for Managers", BCS, The Chartered Institute for IT, 1st Edition, 2020
2. Pankaj Jalote, "Delivering Digital Transformation: A Manager's Guide to the Digital Revolution", De Gruyter Oldenbourg, 1st Edition, 2019

REFERENCES:

1. Claus T. Jensen, "Digital Transformation for Dummies", John Wiley & Sons, Special Edition, 2020
2. David L. Rogers, "The Digital Transformation PlayBook", Columbia University, 1st Edition, 2021

EVALUATION PATTERN:

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

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

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DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER V

		Category: OEC				
U21ITX04	HUMAN RESOURCE MANAGEMENT	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Knowledge of the main sources of information and opinion on management and human resource management
- Improve ability and self-assurance in locating/interacting with mentors and creating networks of support within organizations
- Understand HR concepts and domain knowledge in order to take better decisions

COURSE OUTCOMES:

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

CO1: Comprehend the fundamental concepts of human resource management (Understand)

CO2: Recognise an individual's behaviour in an organization (Understand)

CO3: Examine the leadership styles and powers that can be exhibited in an organization(Understand)

CO4: Create, evaluate, and use sophisticated training tactics and requirements to offer training programmes (Apply)

CO5: Ability to manage and implement employee issue, safety and Health Measures (Apply)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION 9

Nature and scope of human resource management, Evolution of HRM, Challenges of HRM, HR profession and HR department, Functions of HRM, Global perspective of HR

UNIT II HUMAN RESOURCE PLANNING 9

Human resource development – Evolution of HRD - Relationship with HRM - Human resource development functions - Roles and competencies of HRD professionals - Employee behaviour – External and internal influence –Motivation as internal influence – Learning and HRD – Learning strategies and styles

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UNIT III PERFORMANCE EVALUATION 9

Evaluating HRD programs - Models and frame work of evaluation - Assessing the impact of HRD programs - Human resource development applications - Fundamental concepts of socialization - realistic job review - Career management and development

UNIT IV TRAINING AND DEVELOPMENT 9

Need and Importance of training and development - Training need analysis and techniques - Design training programme - Methods of training - Training evaluation - Executive development - Concept of career development

UNIT V EMPLOYEE RELATIONS 9

Ethics and employee rights and discipline - Labor relations and collective bargaining - Employee safety and health - Managing global human resources - Managing human resources in small and entrepreneurial firms

Contact Periods:

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

TEXT BOOKS:

1. Gary Dessler, "Human Resource Management", 17th Edition, Pearson, 2021
2. PravinDurai, "Human Resource Management", 3rd Edition, Pearson,2020

REFERENCES:

1. Luis R. Gomez-Mejia, David B. Balkin, Robert L. Cardy "Managing Human Resources", 9th Edition, Pearson, 2020
2. K Aswathappa, Sadhna Dash, "Human Resource Management - Text and Cases",9th Edition, McGraw Hill, 2021

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 ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER V

U21ECX03	ARDUINO PROGRAMMING	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To study the Arduino development boards and IDE
- To learn the communication between peripherals
- To understand the operations of sensors in real time applications

COURSE OUTCOMES:

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

CO1: Summarize the various development boards of Arduino families (Understand)
CO2: Explain the fundamentals of Arduino programming (Understand)
CO3: Develop simple applications using suitable sensors (Apply)
CO4: Illustrate the performance of communication protocols (Understand)
CO5: Build the real–time applications using Arduino (Analyze)

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	-	-	-	2	-	-	-	2	-	-	2		
CO3	3	2	2	-	2	-	-	-	2	-	-	2		
CO4	2	-	-	-	-	-	-	-	2	-	-	2		
CO5	3	3	2	-	2	-	-	-	2	-	-	2		

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

SYLLABUS:

UNIT I ARDUINO BOARD CHARACTERISTICS 9

Arduino families– Uno, Leonardo, Ethernet, Mega 2560 – Shields – motor, wireless SD, Ethernet, Wi-Fi, GSM – IDE tool

UNIT II PROGRAMMING LANGUAGE 9

Variables and data types – Control structures – Functions – I/O, time, mathematical, constants, interrupts – Standard libraries – Simulation using Arduino IDE

UNIT III SENSORS AND MOTORS 9

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

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UNIT IV PERIPHERAL COMMUNICATION 9

UART communications – SPI bus – configuration, communications, SPI library – I2C protocol, master and slave communications – Ethernet on Arduino – Arduino Wi-Fi channels

UNIT V DISPLAY AND APPLICATIONS 9

Liquid crystal – Liquid crystal library, writing text, cursor commands, text orientation, scrolling, custom text – LED display – Water level management system – Home automation – Automatic irrigation system – Industry automation

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Simon Monk, "Programming Arduino – Getting Started with Sketches", 2nd edition, Tata Mc Graw Hill, 2016
2. James A. Langbridge, "Arduino Sketches tools and techniques for programming" wizardry Wiley, 1st edition, 2015

REFERENCES:

1. Massimo Banzi, Michael Shiloh, Make: "Getting Started with Arduino: The Open Source Electronics Prototyping Platform", 3rd edition, LLC, 2015
2. Richard Blum, "Arduino Programming in 24 hours", 3rd edition, Pearson Education, 2015.
3. Brock Craft, "Arduino Projects for Dummies", 2nd edition, John Wiley & Sons Inc, 2013
4. John Boxall, "Arduino Workshop – A Hands–On Introduction with 65 Projects", 1st edition, William Pollock, 2013

EVALUATION PATTERN:

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

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

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SEMESTER V

		Category: OEC				
U21ECX04	E-WASTE MANAGEMENT	L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the importance of e-waste management
- To learn various e-waste handling mechanisms for proper disposal and recycling
- To study the emerging technologies and methodologies of e-waste management

COURSE OUTCOMES:

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

CO1: Explain the environmental impacts of e-waste (Understand)

CO2: Classify various materials used in e-waste management hierarchy (Understand)

CO3: Summarize different processes involved in e-waste management and handling (Understand)

CO4: Implement the appropriate e–waste management treatment for recycling and recovery (Apply)

CO5: Apply the principles of emerging technologies for e-waste management (Apply)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I OVERVIEW OF E-WASTE MANAGEMENT 9

Introduction – Legislative influences on electronics recycling – Socio-economic factors – Recycling hierarchy and markets for recyclate – Future factors influence of electronic waste management

UNIT II MATERIALS FOR ELECTRONIC DEVICES 9

Impact of legislation on materials used in electronics – Soldering and the move to lead-free assembly – Printed circuit board materials – Encapsulants of electronic components – Indium tin oxide and LCD screens

UNIT III DUMPING, BURNING AND LANDFILL 9

Waste inputs to different management options – Landfill – Pollution from landfills, landfill gas, leachate and landfill-site construction – Burning – Incineration, mass burn, energy from waste, advanced thermal processing, pollution from incineration

UNIT IV RECYCLING AND RECOVERY 9

Separation and sorting – Treatment – Refrigeration equipment, individual processes – Thermal treatments, hydrometallurgical extraction, sensing technologies

UNIT V INTEGRATED APPROACH TO E-WASTE MANAGEMENT 9

Emerging technologies – Comminution, dry capture technologies, design of recycling and inverse management – Sector based eco-design – Fasteners, design methodology and resource efficiency, constraints on materials selection

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. A.K.Hargi, "Waste Management: Research Advances to Convert Waste to Wealth", Nova Science Publishers, 1st edition, 2010
2. Hester R.E., and Harrison R.M, "Electronic Waste Management", RSC Publishing, 1st edition, 2009

REFERENCES:

1. John Pichtel, "Waste Management Practices-Municipal, Hazardous and Industrial", CRC Press, 2nd edition, 2014
2. Fowler B, "Electronic Waste – Toxicology and Public Health Issues", Elsevier, 1st edition, 2007
3. Isa Baud, Johnan Post and Christine Furedy, "Solid Waste Management and Recycling", Kluwer Academic Publishers, 1st edition, 2004
4. Nicholas P. Cheremisinoff, "Handbook of Solid Waste Management and Waste Minimization Technologies", Elsevier, 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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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21EEX03	ENERGY TECHNOLOGY	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge of general aspect energy sources
- To understand the energy conscious concepts
- To understand the concept of capital cost of energy management system

COURSE OUTCOMES:

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

CO1: Explain about renewable energy resources and its importance (Understand)
CO2: Understand the process of photovoltaic power generation (Understand)
CO3: Interpret the process of power generation using wind energy sources (Understand)
CO4: Summarize the role of bio energy in power generation (Understand)
CO5: Infer the fundamentals of other available renewable energy sources (Understand)

CO-PO MAPPING:

COs \ POs	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 ENERGY 9

Global energy scenario – Classification of energy sources – Energy scenario in India – Growth of energy sector – Planning in India – Importance of renewable energy sources – Environmental impact of fossil fuels – Efficiency and Security

UNIT II SOLAR ENERGY 9

Basic concepts – Concentrating and non-concentrating collectors – Solar water heater – Photo voltaic technology – Solar cells – Characteristics of PV systems – Standalone photovoltaic system

UNIT III WIND ENERGY 9

Wind speed and power relation components – Turbine types – Turbine rating – Choice of generators and site selection – Wind energy forecasting – Variable speed operation – Maximum power operation

UNIT IV BIO ENERGY 9

Bio-mass and bio-gas: principles of bio-conversion – Bio-gas digester types – Floating dome – Fixed dome – Algae biomass – Large scale culture and harvest methodologies – Open raceway ponds

UNIT V ENERGY MANAGEMENT 9

Energy conservation – Act: Energy management importance – Duties and responsibilities – Energy audit – Types – Methodology

Contact Periods:

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

TEXT BOOKS:

1. Kothari, "Renewable Energy Sources and Emerging Technologies", 2nd edition, PHI learning Pvt. Ltd., 2013
2. Khan B.H., "Non-Conventional Energy Resources", 2nd edition, Tata McGraw Hill Education, 2017

REFERENCES:

1. Sukhatme S.P. and Nayak J.K., "Solar Energy", 3rd edition,Tata McGraw Hill, 2017
2. Burton T., "Wind Energy Handbook", 2nd edition, John Wiley and Sons, 2011
3. Ibrahim Dincer and Mark A. Rosen, "Thermal Energy Storage Systems and Applications", 2nd edition, John Wiley and Sons, 2011

EVALUATION PATTERN:

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

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

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SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21EEX04	HOME AUTOMATION	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire the knowledge on working principle of various sensors
- To understand the concepts of controllers and communication protocols
- To apply the programming knowledge to establish home automation system

COURSE OUTCOMES:

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

CO1: Classify the working principle of various sensors (Understand)
CO2: Illustrate the function of controllers and relay (Understand)
CO3: Interpret the concept of communication protocols and IoT (Understand)
CO4: Recall the Arduino programming language (Understand)
CO5: Develop the real time home automation application sources (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	1	-	-	-	-	-	-	-	-	1		
CO4	3	2	1	-	2	-	-	-	-	-	-	1		
CO5	3	2	2	1	2	1	-	-	-	-	2	1		
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SYLLABUS:

UNIT I TYPES OF SENSORS 9

Construction, working principle and application: Infrared motion sensor, LDR sensor, ultrasonic sensor, temperature sensor, oxygen sensor, gas sensor, rain sensor and touch sensor

UNIT II CONTROLLERS AND RELAY 9

Arduino Uno, Node MCU and Raspberry Pi controller: Construction, pin details, board descriptions and applications – Construction and working principle of relay

UNIT III COMMUNICATION PROTOCOLS AND IoT 9

Importance of protocols – Inter and intra system protocols – HTTP protocol – Bluetooth – Wireless Fidelity (WiFi) – Basics of Internet of Things (IoT) – IoT architecture

UNIT IV ARDUINO PROGRAMMING 9

Basics of Arduino software – Arduino coding: Code structure, data types, statement operators, control statements, looping statements, input/output control and sample coding for lamp and motion control – Basics of Tinker cad simulation

UNIT V APPLICATIONS 9

Interfacing of sensors with controller – Fire alarm system - Gas leakage detection system - Burglar alarm system – Arduino Uno and Node MCU: Lamp, motion and temperature control using Bluetooth and WiFi

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Halit Eren, John G. Webster, "Measurement, Instrumentation, and Sensors Handbook", 2nd edition, CRC Press, 2017
2. Simon Monk, "Programming Arduino Getting Started with Sketches", 2nd edition, McGraw-Hill Education, 2011
3. Dr. Umesh Dutta, Nilansh Khurana, Devdutt, "The Internet of Things Using NODEMCU", 1st edition, Blue Rose Publishers, 2021

REFERENCES:

1. Volker Ziemann, "A Hands-On Course in Sensors Using the Arduino and Raspberry Pi", 1st edition, CRC Press, 2018
2. Donald Norris, "The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and Beagle Bone Black", 1st edition, McGraw-Hill Education, 2015
3. Simon Monk, "Arduino + Android Projects for the Evil Genius", 1st edition, McGraw-Hill Tab Electronics, 2011

EVALUATION PATTERN:

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

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

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DEPARTMENT OF MECHANICAL ENGINEERING

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21MEX03	INDUSTRIAL SAFETY	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To impart knowledge on safety engineering fundamentals and safety management practices
- To impart knowledge on various safety measures and the government acts for industrial safety
- To provide insight about various safety monitoring techniques

COURSE OUTCOMES:

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

CO1: Discuss the modern safety concepts, policies, audit and analysis in the industries (Understand)

CO2: Explain the impact of chemical hazardous substances in the industries (Understand)

CO3: Explain about various protective measures taken to protect noise pollution (Understand)

CO4: Identify and implement appropriate safety monitoring techniques used in the industry for enhancing the safety of worker (Apply)

CO5: Explain the various regulations and industrial safety act (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I CONCEPTS AND TECHNIQUES 9

Evolution of modern safety concept – Safety policy – Safety Organization – Line and staff functions for safety – Safety Committee – Budgeting for safety – Incident Recall Technique (IRT) – Disaster control – Job Safety Analysis (JSA) – Safety survey – Safety inspection – Safety sampling – Safety Audit

UNIT II CHEMICAL HAZARDS 9

Chemical exposure – Toxic materials – Ionizing Radiation and Non–ionizing Radiation – Industrial Hygiene – Industrial Toxicology – Case study

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Learn Beyond

UNIT III ENVIRONMENTAL CONTROL 9

Industrial Health Hazards – Environmental Control – Industrial Noise – Noise measuring instruments – Control of Noise – Vibration – Personal Protection

UNIT IV SAFETY PERFORMANCE MONITORING 9

Reactive and proactive monitoring techniques – Permanent total disabilities – Permanent partial disabilities – Temporary total disabilities – Calculation of accident indices – Frequency rate – Severity rate, frequency severity incidence – Incident rate – Accident rate – Safety "t" score – Safety activity rate – Problems

UNIT V SAFETY REGULATIONS AND EDUCATION 9

Explosions – Disaster management – catastrophe control – Hazard control – Safety education and training – Factories Act – Safety regulations Product safety – Case studies

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. John V. Grimaldi, Rollin H. Simon "Safety Management", 5th edition, AITB S Publishers, 2022
2. A.K. Gupta, "Industrial Safety Management", 1st edition, University Science Press, 2009

REFERENCES:

1. R K Jain, "Industrial Safety, Health and Environment Management Systems", 1st edition, Khanna Publisher, 2008
2. Pratibha Bansal, Anupama Prashar, "Industrial Safety and Environment", 1st edition S. K. Kataria & Sons Publishers, 2013
3. Harsimran Singh Sodhi, Doordarshi Singh, "A Text Book on Industrial Safety', 3rd edition, Lambert Academic Publisher, 2019

EVALUATION PATTERN:

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

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

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SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21MEX04	ADDITIVE MANUFACTURING AND 3D PRINTING	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- Know the principles, methods, areas of usage, possibilities and limitations of the additive manufacturing technologies
- Familiarize with the characteristics of various materials that are used in additive Manufacturing
- Discuss the various applications of additive manufacturing

COURSE OUTCOMES:

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

CO1: Explain the fundaments of additive manufacturing (Understand)

CO2: Discuss on reverse engineering (Understand)

CO3: Illustrate the liquid and solid based AM systems (Understand)

CO4: Explain the laser based additive manufacturing process (Understand)

CO5: Important knowledge on the application of various AM process (Understand)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I INTRODUCTION 9

Overview – History – Need–Classification – Additive Manufacturing Technology in product development – Materials for Additive Manufacturing Technology

UNIT II REVERSE ENGINEERING 9

Basic Concept – 3D Scanning Digitization techniques – Model Reconstruction – Data Processing for Additive Manufacturing Technology – Part Orientation and support generation – Model Slicing – Tool path Generation – Applications and Case Studies of Reverse Engineering

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UNIT III LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS 9

Classification – Stereolithography Apparatus (SLA) – Principle – Process – Advantages – Fused Deposition Modeling – Principle – Process – Advantages

UNIT IV LASER BASED ADDITIVE MANUFACTURING SYSTEMS 9

Selective Laser Sintering – Principle – Process – Advantages – Three-Dimensional Printing – Principle process – Advantages – Laser Engineered Net Shaping (LENS) – Applications

UNIT V APPLICATIONS OF ADDITIVE MANUFACTURING PROCESS 9

Customized implants and prosthesis: Design and development – Bio – Additive Manufacturing – Computer Aided Tissue Engineering (CATE) – Applications of 3D Printing in Aerospace – Automotive – Manufacturing and Architectural Engineering

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", 3rd edition, World Scientific Publishers, 2010
2. Douglas Bryden, "CAD and Prototyping for Product Design", 2nd edition Laurence King Publishing, 2014

REFERENCES:

1. Liou L.W. and Liou F.W., "Rapid Prototyping and Engineering applications: A tool box for prototype development", 3rd edition CRC Press, 2012
2. Kamrani A.K. and Nasr E.A., "Rapid Prototyping: Theory and practice", 4th edition Springer, 2014
3. Gebhardt A., "Rapid prototyping", 4th edition, Hanser Gardener Publications, 2011
4. Hilton P.D. and Jacobs P.F., "Rapid Tooling: Technologies and Industrial Applications", 3rd edition CRC press, 2010

EVALUATION PATTERN:

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

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

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DEPARTMENT OF MECHATRONICS ENGINEERING

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21MIX03	MEMS & NEMS	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To learn about the basic concepts of MEMS and NEMS
- To familiarizes the concept of fabrication, manufacturing and packaging of Microsystem
- To know the applications of Micro and Nano product for various applications

COURSE OUTCOMES:

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

CO1: Interpret the basics of micro sensors and micro actuators (Understand)
CO2: Identify the suitable fabrication process of microsystem (Understand)
CO3: Develop the micro systems for various applications (Apply)
CO4: Elucidate the function of nanoscale materials (Understand)
CO5: Infer the concept of Nano-electronic devices (Apply)

CO-PO MAPPING:

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

SYLLABUS:

UNIT I MICROSYSTEMS, MICROSENSORS AND ACTUATORS 9

Overview - Microsystems - Working principle of Microsystems - Micro sensors - Micro actuation techniques - Micropump - Micromotors - Microvalves - Microgrippers.

UNIT II MICROSYSTEM FABRICATION 9

Substrates - Single crystal silicon wafer formation - MEMS materials - Photolithography - Ion implantation - Diffusion - Oxidation - CVD - Physical Vapor Deposition - Deposition by epitaxy – Etching process.

UNIT III MICROSYSTEM MANUFACTURING AND DESIGN 9

Bulk Micromanufacturing - Surface Micromachining - LIGA - SLIGA. Micro system packaging - Materials - Die level - Device level - System level - Packaging techniques -

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Surface bonding - Wire bonding – Sealing - Design considerations - Micro System Applications

UNIT IV INTRODUCTION AND OVERVIEW: NANOSCALE 9

Mendeleyev's Periodic Table of Elements and Electronic Configurations - Nanoengineering and Nanoscience - Carbon Nanoelectronics: Carbon Nanotubes - Analysis of Carbon Nanotubes - Classification of Carbon Nanotubes

UNIT V MODELING OF NANO-ELECTROMECHANICAL SYSTEMS 9

Introduction to Modelling, Analysis, and Simulation of NEMS - Newtonian Mechanics - Functional Nano-Electro-mechanical Systems - Piezo actuators: Steady-state models and Characteristics.

Contact Periods:

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

Total 45 Periods

TEXTBOOKS:

1. Tai-Ran Hsu, "MEMS And Microsystems: Design and Manufacture", 1st Edition, McGraw-Hill Education Pvt. Ltd, New Delhi, 2017.
2. Lyshevski, S.E, "Nano- and Micro-Electromechanical Systems: Fundamentals of Nano- and Microengineering", 2nd Edition, CRC Press, 2005.

REFERENCES:

1. Zhang, Dan, Wei, Bin, "Advanced Mechatronics and MEMS Devices II", 1st Edition, Springer International Publishing, 2017.
2. Takahata, K, "Advances in Micro/Nano Electromechanical Systems and Fabrication Technologies" 1st Edition, InTech Pvt. Ltd, 2013.

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 MECHATRONICS ENGINEERING

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21MIX04	ROBOTICS PROCESS AUTOMATION	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To provide insights on robotic process automation (RPA) technology and its value proposition
- To introduce different platforms for RPA
- To illustrate basic programming concepts and the underlying logic/structure related to RPA
- To describe the different types of variables, control flow and data manipulation techniques in a RPA platform
- To describe automation to email and various types of exceptions and strategies to handle

COURSE OUTCOMES:

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

CO1: Gain insights into Robotic Process Automation Technology (Understand)
CO2: Demonstrate the underlying logic/structure related to RPA (Understand)
CO3: Classify several types of data inside a workflow and, gain skills in building workflows in a RPA platform (Understand)
CO4: Comprehend different types of variables, pdf automation and data manipulation techniques (Understand)
CO5: Design automation to Email and various types of Exceptions and strategies to handle (Apply)

CO-PO MAPPING:

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

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

SYLLABUS:

UNIT I INTRODUCTION TO RPA 9

Emergence of Robotic Process Automation (RPA), Evolution of RPA, Future of RPA, Differentiating RPA from Automation, Defining Robotic Process Automation & its benefits, What RPA is Not, Types of Bots, Application areas of RPA, How Robotic Process Automation works, RPA development methodology and key considerations.

UNIT II ROBOTIC PROCESS AUTOMATION PLATFORMS 9

Components of RPA - RPA Platforms - Types of templates, user interfaces, domain in activities, variables, arguments, imports panel and user events - About Ui Path - The future of automation -

Record and Play - Downloading and installing UiPath Studio - Learning Ui Path Studio - Task recorder - Step-by step examples using the recorder.

UNIT III TAKING CONTROL OF THE CONTROLS 9

Finding and attaching windows - Finding the control - Techniques for waiting for a control - Act on controls - mouse and keyboard activities - Working with UiExplorer - Handling events - Revisit recorder - Screen Scraping - When to use OCR - Types of OCR available - How to use OCR - Avoiding typical failure points.

UNIT IV DATA MANIPULATION AND PDF AUTOMATION 9

Data Manipulation, Automation of Virtual Machines, Introduction to Native Citrix Automation, Text and Image Automation, PDF Automation, Computer Vision.

UNIT V EXCEPTION HANDLING, DEBUGGING AND LOGGING 9

Exception Handling, Debugging, and Logging - Exception handling - Common exceptions and ways to handle them - Logging and taking screenshots - Debugging techniques - Collecting crash dumps - Error reporting - Future of RPA.

Contact Periods:

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

Total 45 Periods

TEXTBOOKS:

1. Tom Taulli , "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress publications, 2020.
2. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath by Alok Mani Tripathi, Packt Publishing, Mumbai, 2018.

REFERENCES:

1. A Gerardus Blokdyk, "Robotic Process Automation Rpa A Complete Guide ", 2020.
2. Richard Murdoch, "Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant",1st Edition, Independently published, 2018.
3. Frank Casale, Rebecca Dilla, Heidi Jaynes and Lauren Livingston, "Introduction to Robotic Process Automation: A Primer".

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 MATHEMATICS

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21MAX01	MATHEMATICAL MODELING AND SIMULATION (Common to all)	3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic concepts of mathematical modeling
- To understand the applications using modeling and simulation
- To identify different optimization techniques

COURSE OUTCOMES:

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

CO1: Apply the basics of mathematical tools using Sage Math (Apply)

CO2: Apply the structure of coding and error analysis (Apply)

CO3: Interpret modeling of techniques (Understand)

CO4: Implement optimization techniques to resolve problems (Understand)

CO5: Use the mathematical modeling to solve the engineering 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		
CO2	3	2	1	-	1	-	-	-	-	-	-	1		
CO3	3	2	1	-	1	-	-	-	-	-	-	1		
CO4	3	2	1	-	1	-	-	-	-	-	-	1		
CO5	3	2	1	-	1	-	-	-	1	-	-	1		

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

SYLLABUS:

UNIT I MATHEMATICAL PROGRAMMING 9

Math reckoner – Structuring data – Polynomial systems – Analysis – Graphics and computational domains using Sage Math

UNIT II FUNCTIONS AND CODING BLOCKS 9

Basic syntax in Matlab – Common functions – Basic graphics – Structure of coding – Program execution – Error analysis

UNIT III SYSTEM MODELING AND SIMULATION 9

Fundamentals of modeling using Matlab – Classification of models – Modeling techniques – Mathematical modeling of physical systems – Simulations: constructing, running and saving data in Matlab – Interpretation of results

UNIT IV OPTIMIZATION TECHNIQUES 9

Functions of linear and non-linear optimization – Optimization using numerical methods: solving equations – Optimization techniques using toolbox – Optimization using symbolic computation

UNIT V APPLICATIONS 9

Modeling in electric circuits – Car safety bumper – Water flow in a river – Heat conduction in a square plate using Matlab

Contact Periods:

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

Total: 45 Periods

TEXT BOOKS:

1. Paul Zimmermann, "Computational Mathematics with Sage Math", 1st edition, SIAM Publications, 2019.
2. Devendra K Chaturvedi, "Modeling and simulation of systems using MATLAB and Simulink", CRC press, 1st edition, 2017.

REFERENCES:

1. Niket S Kaisare, "Computational Techniques for Process Simulation and Analysis Using MATLAB", CRC Press, 1st edition, 2017.
2. Cesar Lopez, "MATLAB optimization techniques", A press, 1st edition, 2014.
3. William J Paul, "MATLAB for engineering applications", Mc Graw Hill, 4th edition, 2018.
4. Steven I Gordon and Brian Guilfoos, "Introduction to Modeling and Simulation with MATLAB and Python", CRC Press, 1st edition, 2017.
5. Andrew Knight, "Basics of MATLAB and beyond", CRC press, 1st edition, 2019.

EVALUATION PATTERN:

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

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

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CENTRE FOR INNOVATION, INCUBATION AND ENTREPRENEURSHIP DEVELOPMENT

SEMESTER V

		Category: OEC				
		L	T	P	J	C
U21CAX01	ENTREPRENEURSHIP DEVELOPMENT AND STARTUP	3	0	0	0	3

PRE–REQUISITES:

- NIL

COURSE OBJECTIVES:

- To know the basic concepts in the area of entrepreneurship
- To identify entrepreneurial opportunities
- To create awareness on the new venture creation for startup.

COURSE OUTCOMES:

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

CO1: Discuss the fundamentals of entrepreneurship (Understand)

CO2: Suggest different forms of new venture development (Understand)

CO3: Assess business plan, business pitch as an entrepreneurial tool (Understand)

CO4: Explain the methodology to start an enterprise in a systematic manner (Understand)

CO5: Make use of the different Government initiatives and support organizations for starting new venture (Understand)

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		

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

SYLLABUS:

UNIT I ENTREPRENEURSHIP 9

Concept of entrepreneurship – characteristics and Types of entrepreneurship – Factors affecting entrepreneurs – Entrepreneurship mindset – difference between inventors and entrepreneurs – companies vs startups – Entrepreneurial environment – Entrepreneurial growth –Role of entrepreneurship in economic development

UNIT II CREATING ENTREPRENEURIAL VENTURE 9

Creating and Starting the Venture: Sources of new Ideas – Methods of generating ideas – creating, problem solving – product planning and development process – Various forms of business organizations : Sole proprietorship – Partnership – Limited liability partnership firms – Corporation – Franchising – Setup process of small scale enterprise, procedures for Registration of small scale industry

UNIT III BUSINESS PLAN AND PITCH **9**

Nature of Business plan – Writing business plan – Evaluating business plan, implementing business plan – Marketing plan – Financial plan – Organizational plan – Business pitch –Preparing investor presentation – Element of the perfect investment pitch –delivering of investor pitch to panel of investors

UNIT IV START-UP OPPORTUNITIES AND PROCESS **9**

Introduction to design thinking – Idea Generation with brainstorming – New industrial revolution – Business startup – Ideation – Venture choices – Startup policy – Startup opportunities, Registration and Legal process of startups – Startup Ecosystem – Business startups – Legal environment – Approval for new ventures – Taxes or duties payable for new ventures

UNIT V GOVERNMENT INITIATIVES AND INSTITUTIONAL SUPPORT **9**

Role of Central Government and State Government in promoting entrepreneurship with various incentives, subsidies, grants, programs, schemes and challenges – Government initiatives and inclusive entrepreneurial Growth – Startup India Scheme – MSME Act – MEME policy in India – TN Startup schemes –Source of entrepreneurial finance – Commercial banks – Venture capital, angel investors – Funding startups with bootstrapping – Crowd funding – Strategic alliances

Contact Periods:

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

Total 45 Periods

TEXT BOOKS:

1. Khanna, S. S., "Entrepreneurial Development", S. Chand & Co. Ltd, New Delhi, 1999
2. Charantimath, P.M, "Entrepreneurship Development and Small Business Enterprises", 10th edition, Pearson Education, India, 2006

REFERENCES:

1. N.P.Srinivasan & G.P.Gupta," Entrepreneurial Development ", Sultan chand and &Sons, India, 2020
2. Anil Kumar.S, "Entrepreneurship Development", New Age International (P) Ltd., 2003.
3. Aurangabadkar P, Singh S, "Startup and New Venture Management" 7th edition, Nirali Prak[illegible]an, 2018
4. Kathleen R Allen, "Launching New Ventures - An Entrepreneurial Approach", 7th edition, C[illegible]ge Learning, 2016

EVALUATION PATTERN:

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

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

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Learn Beyond

(Autonomous, NAAC "A")

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