ARTIFICIAL INTELLIGENCE & MACHINE LEARNING								
Course code: COOE302				**Semester: VI**				
Teaching Scheme				**Evaluation Scheme**				
Contact Hours/Week				**Theory**				
				End Term	**Progressive Assessment**			**Total Marks**
L	**T**	**P**	**Credit**		**Class Test**	**Assignment**	**Attendance**	
2	1	0	3	60	20	15	5	100

Rationale / Course Learning Objectives: -

Have a thorough understanding of classical and modern AI applications. Be able to implement a wide range of AI concepts using Python. Understand non-classical AI approaches such as genetic algorithms and neural networks. Be able to assess the potential of AI in research and real-world environments.

Course Content:

UNIT NO	UNIT	HOURS	MARKS
1	**Introduction:** 1. What is Artificial Intelligence (AI) 2. History and Foundations of AI 3. Goals and Types of AI 4. Pros and Cons of AI 5. Problem Solving: Uninformed and Informed Search 6. Constraint Satisfaction Problems 7. Constrained Optimization problems (complete and incomplete techniques).	6	8
2	**Adversarial Search:** 1. What is Adversarial Search 2. Minimax Algorithm 3. Alpha Beta Pruning 4. Two Players Games, Games with uncertainty 5. Decision Support Systems and Technologies; 6. Knowledge Representation i. Types and Properties of Knowledge Representation ii. Knowledge Representation Techniques iii. Reasoning in AI	10	12
3	**Machine Learning Basics** 1. Machine Learning (ML) and its Applications in various domains 2. Machine Learning Paradigms i. Supervised Learning ii. Unsupervised Learning iii. Semi-supervised Learning iv. Reinforcement Learning 3. The Machine Learning Workflow 4. Introduction to Neural Networks	9	12

4	**Machine Learning Algorithms** 1. Linear Regression, 2. Logistic Regression, 3. K-Nearest Neighbor (KNN) Algorithm, 4. Decision Tree, 5. Gradient Descent, 6. SSE and MSE, 7. Overfitting and Underfitting 8. Training, Validation and Test data.	12	14
5	**Classification Problems** 1. Classification Problems in Machine Learning 2. Types of Classification Problems i. Binary Classification ii. Multi-Class Classification iii. Multi-Label Classification iv. Imbalanced Classification 3. Learners in Classification Algorithms i. Lazy Learner ii. Eager Learner 4. Decision Boundaries 5. Probability and Classification 6. Naive Bayes and Gaussian Class-Conditional Distribution 7. Evaluation of Classification Models: i. Confusion Matrix ii. Accuracy iii. Precision iv. Sensitivity v. Specificity vi. F1 Score 8. Applications of Classification Problems 9. Case Study of Spam Classification in e-mail.	11	14
	TOTAL	**48**	**60**

Specification Table Showing Distribution of Marks and Hours

Unit No	UNIT	HOURS	Marks			
			K	C	A	Total Mark
1	Introduction	6	3	2	3	8
2	Adversarial Search	10	3	4	5	12
3	Machine Learning Basics	9	2	4	6	12
4	Machine Learning Algorithms	12	3	4	7	14
5	Classification Problems	11	3	4	7	14
	TOTAL	**48**	**14**	**18**	**28**	**60**

Abbreviations: **K**=Knowledge level, **C**= Comprehension Level, **A**=Application level

Reference Books:

1. Russell, Norvig, Artificial intelligence: A modern approach, 2nd edition. Pearson/Prentice Hall.
2. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House, New Delhi (2018)
3. V.K. Jain, Machine Learning, Khanna Publishing House, New Delhi (2018)
4. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012.

Course Outcomes:

At the end of the course, the student will be able to:

CO1	Identify problems that are amenable to solution by AI methods.
CO2	Design and carry out an empirical evaluation of different algorithms on a problem formalization and state the conclusions that the evaluation supports.
CO3	Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
CO4	Able to design and implement various machine learning algorithms in a range of real-world applications.
CO5	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

ELECTIVE (DISASTER MANAGEMENT)

L	T	P
3	-	0

Name of the course: **ELECTIVE (DISASTER MANAGEMENT)**	
Course code:	**Semester-Sixth**
Teaching Scheme	**MaximumMarks:100**
	PA and End Examination Scheme
Lecturer: 3 hrs/week	Mid Terms:20Marks
Tutorial: 0 hrs/week	Assignment/Quizetc.:15Marks Attendance:5 Marks Sessional:0 Marks
Practical: 0 hrs/week	End Semester Theory: 60 Marks Practical End Exam:0 Viva:0 Marks
Credit : 3	

RATIONALE

Students at diploma level are to understand about Disaster management not only as part of study but to be equipped with life skills and to provide basic conceptual understanding of disasters. It is to understand approaches of Disaster Management against various types of disasters and to build skills to respond to disaster and have an idea of structures that respond to disasters such as earthquakes, floods, landslides etc.

DETAILEDCONTENTS

1. Introduction to disasters

1.1 Definition and types of disaster Hazards and Disasters, Risk and Vulnerability in Disasters

1.2 Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes.

1.3 Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

2. Study of relevant disasters

2.1Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate. case studies of disasters hilly regions (e.g) Earthquakes, Landside).

1.2 Drought types and its management, landside and its managements flood types and its management in plain regions.

1.3 Social Economics and Environmental impact of disasters.

3. Mitigation and management techniques of disaster.

1.1 Basic principles of disasters management

1.2 Disaster Management cycle

1.3 Disaster management policy

1.4 National and State Bodies for Disaster Management

1.5 Early Warming Systems, Building design and construction in highly seismic zones, retrofitting of buildings.

4. Training, awareness program and project on disaster management.

4.1Training and drills for disaster preparedness, Awareness generation program.

4.2Usages of GIS and Remote sensing techniques in disaster management.

PROJECT & REPORT

Landslide hazard zones – case Studies. Earthquake vulnerability assessment of buildings and infrastructure-case studies. Drought assessment- case studies. Coastal flooding, storm surge assessment, floods (fluvial and pluvial flooding) – case Studies. Forest fire – case studies. Manmade disasters – case studies. Space based inputs for disaster mitigation and management. Field work related to disaster management

Students are to prepare a mini project on disaster risk assessment and preparedness for a specific disaster reference to disasters in hilly regions.

RECOMMENDED BOOKS

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)

2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.

3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.

4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.

5. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India L

Topic`No.	Time Allotted (hrs)	Marks Allotted
1	12	25
2	12	25
3	12	25
4	12	25
Total	48	**100**

Course Code	**:**	**HS 302**			
Course Title	**:**	**Entrepreneurship and Start-ups**			
Number of Credits	:	4 (L:3, T:1, P:0)			
Prerequisites (Course code)	:	None			
Course Category	:	HS			
Evaluation Scheme	:	End Exam	Progressive Assessment		
			Class Test	Assignment	Attendance
		60	20	15	5

Course Learning Objectives:

1. Acquiring Entrepreneurial spirit and resourcefulness.
2. Familiarization with various uses of human resource for earning dignified means of living.
3. Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
4. Acquiring entrepreneurial quality, competency, and motivation.
5. Learning the process and skills of creation and management of entrepreneurial venture.

Course Content:

Unit 1 - Introduction to Entrepreneurship and Start – Ups

- Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation
- Types of Business Structures, Similarities/differences between entrepreneurs and managers.

Unit 2 – Business Ideas and their implementation

- Discovering ideas and visualizing the business
- Activity map
- Business Plan

Unit 3 – Idea to Start-up

- Market Analysis – Identifying the target market,
- Competition evaluation and Strategy Development,
- Marketing and accounting,
- Risk analysis

Unit 4 – Management

- Company's Organization Structure,
- Recruitment and management of talent.
- Financial organization and management

Unit 5 - Financing and Protection of Ideas

- Financing methods available for start-ups in India
- Communication of Ideas to potential investors – Investor Pitch
  Patenting and Licenses

Unit 6: Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy

Learning Outcome:

Upon completion of the course, the student will be able to demonstrate knowledge of the following topics:

1) Understanding the dynamic role of entrepreneurship and small businesses
2) Organizing and Managing a Small Business
3) Financial Planning and Control
4) Forms of Ownership for Small Business
5) Strategic Marketing Planning
6) New Product or Service Development
7) Business Plan Creation

SUGGESTED LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN – 978-0984999392
2.	The Lean Startup: How Today's Entre-preneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN – 978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN – 978-0755388974
4.	The Innovator's Dilemma: The Revolu- tionary Book That Will Change the Way You Do Business	Clayton M. Chris-tensen	Harvard business ISBN: 978-142219602

SUGGESTED SOFTWARE/LEARNING WEBSITES:

a. https://www.fundable.com/learn/resources/guides/startup
b. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate-structure/
c. https://www.finder.com/small-business-finance-tips
d. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K= Knowledge Level; C= Comprehension Level; A= Application Level

Unit No.	Unit Title	Hours	Marks			
			K	C	A	Total Marks
1	Introduction to Entrepreneurship & Start ups	8	2	3	3	8
2	Business Ideas & their implementation	12	2	4	6	12
3	Idea to Start ups	12	2	2	8	12
4	Management	10	2	2	6	10
5	Financing and protection of Ideas	10	2	3	5	10
6	Exit strategies for entrepreneurs.	8	2	3	3	8
	Total	**60**	**12**	**17**	**31**	**60**

Course Code	:	ES104
Course Title	:	Fundamentals of Electrical and Electronics Engineering
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

K=Knowledge Level, C=Comprehension Level, A=Application Level

Unit No.	Unit Title	Hours	Marks			
			K	C	A	Total Marks
I	Overview of Electronic Components & Signals	7	4	3	2	9
II	Overview of Analog Circuits	5	2	2	3	7
III	Overview of Digital Electronics	8	2	3	5	10
IV	DC & A.C. Circuits	9	3	5	4	12
V	Electric and Magnetic Circuits	9	3	4	5	12
VI	Transformer and Machines	7	2	5	3	10
	Total	**45**				**60**

Course Objectives:

To provide basic knowledge of the different elements and concepts of electrical engineering field and to learn basic concepts of various active and passive electronic components, Signals, Op-Amp and their applications, Digital Electronics and their applications, Transformer and Machines to help students deal with electrical and electronics engineering principles and applications in industrial processes of different fields.

Course Content:

UNIT I- Overview of Electronic Components & Signals:

Passive Active Components: Resistances, Capacitors, Inductors, Diodes, Transistors, FET, MOS and CMOS and their Applications.

Signals: DC/AC, voltage/current, periodic/non-periodic signals, average, RMS, peak values, different types of signal waveforms, Ideal/non-ideal voltage/current sources, independent/dependent voltage current sources.

UNIT II- Overview of Analog Circuits:

Operational Amplifiers-Ideal Op-Amp, Practical op amp, Open loop and closed loop configurations.

Application of Op-Amp as amplifier, adder, differentiator and integrator.

UNIT III- Overview of Digital Electronics:

Introduction to different number systems – Binary, Octal, Decimal, Hexadecimal, Conversion from one number system to another.

Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Gates-Functional Block Approach.

Unit IV -DC & A.C. Circuits:
Units, Work, Energy, Power, series-parallel combination of resistance, Ohms law, KVL, KCL. Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor, Peak Factor, impedance, phase angle, and power factor; Mathematical and phasor representation of alternating emf and current; A.C in resistors, inductors and capacitors.

Unit V- Electric and Magnetic Circuits:

EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, hysteresis loop, reluctance, leakage factor and BH curve; Electromagnetic induction, Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf; Equations of self and mutual inductance; Analogy between electric and magnetic circuits.

Unit VI- Transformer and Machines:
General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and Working principle of motors; Basic equations and characteristic of motors.

References:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
7. Sedha, R.S., A text book of Applied Electronics, S.Chand, New Delhi, 2008, ISBN-13: 978-
   8121927833
8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi,2015, ISBN-13**:** 0070634244-978
9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504
10. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, New Delhi 2015 ISBN : 9780195425239

Course Outcomes:
At the end of the course student will be able to:
1. Describe basic components and signals with their applications.
2. Understand the effect on DC and AC in different elements.
3. Understand the behavior of electric and magnetic circuits.
4. Understand the number systems and its conversion .

6. Understand logic gates and apply them in various electronic circuits.

7. Understand the basic concepts of op-amps, and their applications

Course Code	:	ES110
Course Title	:	Fundamentals of Electrical and Electronics Engineering Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	ES

Suggested Practical/Exercises:

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the Student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Approx. Hrs.
1.	Determine the permeability of magnetic material by plotting its B-H curve.	02
2.	Measure voltage, current and power in 1-phase circuit with resistive load.	02
3.	Measure voltage, current and power in R-L series circuit.	02
4.	Determine the transformation ratio (K) of 1-phase transformer.	02
5.	Connect single phase transformer and measure input and output quantities.	02
6.	Make Star and Delta connection in induction motor starters and measure the line and phase values.	02
7.	Identify various passive electronic components in the given circuit	02
8.	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter.	02
9.	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter.	02*
10.	Identify various active electronic components in the given circuit.	02
11.	Use multimeter to measure the value of given resistor.	02
12.	Use LCR-Q tester to measure the value of given capacitor and inductor.	02
13.	Determine the value of given resistor using digital multimeter to confirm with colour code.	02
14.	Test the PN-junction diodes using digital multimeter.	02
15.	Test the performance of PN-junction diode.	02
16.	Test the performance of Zener diode.	02
17.	Test the performance of LED.	02
18.	Identify three terminals of a transistor using digital multimeter.	02
19.	Test the performance of NPN transistor.	02

20.	Determine the current gain of CE transistor configuration.	02
21.	Test the performance of transistor switch circuit.	02
22.	Test the performance of transistor amplifier circuit.	02
23.	Test Op-Amp as amplifier and Integrator	02
	Total	**46**

References:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House, 2018
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand publications, New Delhi, 2015, ISBN: 9788121924375
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
7. Sedha, R.S., A text book of Applied Electronics, S.Chand ,New Delhi, 2008, ISBN-13: 978-8121927833
8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Eduction, New Delhi,2015, ISBN-13**:** 0070634244-978
9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504
10. Bell Devid, Fundamental of Electronic Devices and Circuits, Oxford University Press, New Delhi 2015 ISBN : 9780195425239

Suggested Softwares/Learning Websites:

a. en.wikipedia.org/wiki/Transformer
b. www.animations.physics.unsw.edu.au//jw/AC.html
c. www.alpharubicon.com/altenergy/understandingAC.htm
d. www.electronics-tutorials
e. learn.sparkfun.com/tutorials/transistors
f. www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf
49 First Year Curriculum Structure Common to All Branches
g. www.technologystudent.com/elec1/transis1.htm
h. www.learningaboutelectronics.com
i. www.electrical4u.com

Course Outcomes:

At the end of the course student will be able to:

1. Understand basic principle and operation of electric circuits and machines.
2. Solve basic problems related to electrical circuits and machines. Explain the operation of different electrical technologies.
3. Demonstrate an understanding of the control systems.
4. Understand the basic circuit elements
5. Understand different types of signal waveforms.
6. Understand logic gates and apply them in various electronic circuits.
7. Understand the basic concepts of op-amps, and their applications.
8. Use relevant electric/electronic protective devices safely.

Course Code	:	**OE###
Course Title	:	ENERGY CONSERVATION AND AUDIT
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	OE

SPECIFICATION TABLE OF MARKS & HOURS

K = Knowledge Level, **C** = Comprehension Level, **A** = Application Level

Sl. No.	Title	Hours	K	C	A	Total Marks
1	**Introduction**	4	4	4	-	8
2	**Energy Conservation Approaches In Industries**	9	4	5	4	13
3	**Energy Conservation Option**	12	5	8	2	15
4	**Performance improvement of existing power plant**	11	7	4	3	14
5	**Energy Audit**	9	2	3	5	10
	Total	**45**				**60**

COURSE OBJECTIVES:

- To Identify demand supply gaps in present scenario.
- To understand conservations approaches to an industry.
- To draw the energy flow diagram of an industry.
- To identify energy wastage and suggest alternative methods.
- To understand the concepts energy audit.

COURSE CONTENT:

UNIT-I: Introduction: General energy problem, Sector wise Energy consumption, demand supply gap, Scope for energy conservation and its benefits; Energy Efficiency Principle – Maximum energy efficiency, Maximum cost effectiveness; Mandatory provisions of EC act; Features of EC act- Standards
and labeling, designated consumers, Energy Conservation Building Codes (ECBC).

Unit-II: Energy Conservation Approaches In Industries: Methods and techniques of energy conservation
in ventilation and air conditioners- compressors pumps, fans and blowers - Area Sealing,
Insulating the Heating / cooling fluid pipes, automatic door closing- Air curtain, Thermostat / Control; Energy conservation in electric furnaces, ovens and boilers.

Unit-III: Energy Conservation Option: New equipment, technology, staffing, training; Calculation and costing of energy conservation project; Depreciation cost, sinking fund method. Cost evaluation by Return On Investment(ROI) and pay back method .

Unit-IV: Performance improvement of existing power plant: cogeneration, small hydro, DG Set; Demand side management; Load response programmes; Types of tariff and restructuring of electric tariff Technical measures to optimize T and D losses.

Unit-V: Energy Audit: Energy audit and its benefits; Energy flow diagram; Preliminary, Detailed energy audit; Methodology of -preliminary energy audit and Detailed energy audit – Phase I, Pre audit, Phase II- Audit and Phase III- Post audit; Energy audit report; Electrical Measuring Instruments

- Power Analyzer.

REFERENCE BOOKS:

1. Electric Energy Generation, Utilisation and Conservation Sivaganaraju, S Pearson, New Delhi, 2012
2. Project Management, Prasanna Chandra, Tata Mcgraw Hill, New Delhi
3. O.P. Jakhar, Energy Conservations in Buildings, Khanna Publishing House, New Delhi
4. Financial Management, Prasanna Chandra Tata Mcgraw Hill, New Delhi.
5. Energy management Handbook, Prasanna Chandra, Tata Mcgraw Hill, New Delhi.
6. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ed. 2018).

COURSE OUTCOMES:

At the end of the course, the student will be able to:
1: Identify demand supply gaps in the present scenario.
2: Understand the conservation approaches for an industry.
3: Draw the energy flow diagram of and industry and identify waste stream.
4: Identify energy wastage and suggest alternative methods.
5 :Evaluate the concepts of energy audit.

Course Code	:	**OE###
Course Title	:	Renewable Energy Technologies
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	OE

SPECIFICATION TABLE OF MARKS & HOURS

K = Knowledge Level, **C** = Comprehension Level, **A** = Application Level

Sl. No.	Title	Hours	K	C	A	Total Marks
1	**Ocean Energy Technologies**	9	4	7	1	12
2	**Solar PV and Concentrated Solar Power Plants**	10	3	6	4	13
3	**Large Wind Power Plant**	9	5	5	2	12
4	**Small Wind Turbines**	8	4	4	3	11
5	**Biomass-based Power Plants**	9	2	5	5	12
	Total	**45**				**60**

COURSE LEARNING OBJECTIVES:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

• Maintain the renewable energy technology equipment.

COURSE CONTENTS:

Unit – I: Ocean Energy Technologies

Ocean energy map of India and its implications; Specification, Construction and working of the following
ocean energy technologies:

• Tidal power technologies
• Wave power technologies
• Marine current technologies
• Ocean Thermal Energy Conversion (OTEC) technologies

Unit – II :Solar PV and Concentrated Solar Power Plants

• Solar Map of India: Global solar power radiation, Solar PV
• Concentrated Solar Power (CSP) plants, construction and working of: Power Tower, Parabolic Trough, Parabolic Dish, Fresnel Reflectors
• Solar Photovoltaic (PV) power plant: components layout, construction, working.
• Rooftop solar PV power system

Unit – III :Large Wind Power Plants

Wind Map of India: Wind power density in watts per square meter, Lift and drag principle; long path theory, Geared type wind power plants: components, layout and working, Direct drive type wind power plants: components, layout and working, Constant Speed Electric Generators: Squirrel Cage Induction Generators (SCIG), Wound Rotor Induction Generator (WRIG), Variable Speed Electric Generators: Doubly-fed induction generator (DFIG), wound rotor synchronous generator (WRSG), permanent magnet synchronous generator (PMSG).

Unit– IV :Small Wind Turbines

• Horizontal axis small wind turbine: direct drive type, components and working.
• Horizontal axis small wind turbine: geared type, components and working.
• Vertical axis small wind turbine: direct drive and geared, components and working.
• Types of towers and installation of small wind turbines on roof tops and open fields.
• Electric generators used in small wind power plants.

Unit– V Biomass-based Power Plants

• Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste.
• Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel gobar gas.
• Layout of a Bio-chemical based (e.g. biogas) power plant.
• Layout of a Thermo-chemical based (e.g. Municipal waste) power plant.
• Layout of a Agro-chemical based (e.g. bio-diesel) power plant.

REFERENCE BOOKS:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
2. Neill, Simon P.; Hashemi, M. Reza: Fundamentals of Ocean Renewable Energy: Generating Electricity from the Sea, Academic Press, ISBN:978-0-12-810448-4
3. David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, Renewable Energy Systems, Pearson Education New Delhi , ISBN: 9789332586826,
4. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning, New Delhi, ISBN:

978-93-88028-49- 3; E-book 978-93-88028-50-9
5. Deambi, Suneel: From Sunlight to Electricity: a practical handbook on solar photovoltaic application;
TERI, New Delhi ISBN:9788179935736
6. Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN: 978-1603580304
7. Wizelius, Tore, Earnest, Joshua - Wind Power Plants and Project Development, PHI Learning, New Delhi, ISBN:978-8120351660
8. Kothari, D.P. et aL: Renewable Energy Sources and Emerging Technologies, PHI Learning, New Delhi, ISBN: -978-81-203-4470-9
9. Bhadra, S.N., Kastha, D., Banerjee, S, Wind Electrical Systems installation; Oxford University Press, New Delhi, ISBN: 9780195670936.

COURSE OUTCOMES:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Maintain ocean thermal energy technologies
- Maintain the optimised working of solar PV and CS power plants.
- Maintain the optimised working of large wind power plants
- Maintain the optimised working of small wind turbines.
- Maintain the optimised working of biomass-based power plants

Name of the Course: Project Management		
Course Code: XXXOE XXX	**Semester: VI**	
Course Category: OE	**Maximum Marks: 100**	
Teaching Scheme	**PA & End Examination Scheme**	
L T P 3 0 0 Total Credit: 3 Lecture: 3 hrs/week Total Contact Hours: 48	**Progressive Assessment (PA)**	
	1. Internal Exam/Class Test	**20 Marks**
	2. Assignment / Quiz etc.	**15 Marks**
	3. Attendance	**5 Marks**
	End Semester Theory Exam	**60 Marks**
	Total	**100 Marks**

Specification table

Unit No	Unit Title	Hours	Marks			
			K	C	A	Total Marks
1	Introduction to Project Management	**10**	**4**	**6**	**0**	**10**
2	Capital budgeting process	**8**	**2**	**4**	**6**	**12**
3	Financial estimates and projections	**10**	**3**	**4**	**6**	**13**
4	Basic techniques in capital budgeting	**8**	**4**	**6**	**0**	**10**
5	Project administration	**12**	**4**	**5**	**6**	**15**
Total		**48**	**17**	**25**	**18**	**60**

Course Objectives:

- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

Course outcomes

At the end of the course, the student will be able to:

CO1	Appreciate the importance of projects and its phases.
CO2	Analyze projects from marketing, operational and financial perspectives.
CO3	Evaluate projects based on discount and non-discount methods.
CO4	Develop network diagrams for planning and execution of a given project.
CO5	Apply crashing procedures for time and cost optimization.

COURSE CONTENT

UNIT-I: Concept of a project: Classification of projects- importance of project management- The project

life cycle- establishing project priorities (scope-cost-time) project priority matrix- work break down structure.

UNIT-II: Capital budgeting process: Planning- Analysis-Selection-Financing-Implementation-Re view. Generation and screening of project ideas- market and demand analysis- Demand forecasting techniques. Market planning and marketing research process- Technical analysis

UNIT-III: Financial estimates and projections: Cost of projects-means of financing-estimates of sales and production-cost of production-working capital requirement and its financing-profitability projected cash flow statement and balance sheet. Break even analysis.

UNIT-IV: Basic techniques in capital budgeting: Non-discounting and discounting methods- payback period- Accounting rate of return-net present value-Benefit cost ratio-internal rate of return. Project risk. Social cost benefit analysis and economic rate of return. Non-financial justification of projects.

UNIT-V: Project administration: progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off. Concepts and uses of PERT cost as a function of time, Project Evaluation and Review Techniques/cost mechanisms. Determination of least cost duration. Post project evaluation. Introduction to various Project management software.

Reference Books:

1. Project planning, analysis, selection, implementation and review – Prasannachandra – Tata McGraw Hill
2. Project Management – the Managerial Process – Clifford F. Gray & Erik W. Larson - McGraw Hill
3. Project management - David I Cleland - Mcgraw Hill International Edition, 1999
4. Project Management – Gopala krishnan – Mcmillan India Ltd.
5. Project Management-Harry-Maylor-Pearson Publication.