| EE3018: Entrepreneurship Development Programme (Open Elective) | |
|---|---|
| **Teaching Scheme** | **Examination Scheme** |
| Lectures : 3 Hrs/Week | Class Test I : 15 Marks |
| Tutorial : -- | Class Test II : 15 Marks |
| Total Credits : 3 | Teachers' Assessment : 10 Marks |
| | End -Semester Exam : 60 Marks |

**Course Description:**
This course is to create awareness about entrepreneurship among students. This course focuses on motivating students for entrepreneurship. The more focus is given on creativity and innovation.

**Course Objectives:**
The objectives of the course are to
1. Introduce various qualities required for entrepreneurship
2. Explain various entrepreneurship models
3. Organize interaction with successful entrepreneurs
4. Introduce to various tools as Six hat techniques, Five S

**Course Outcomes:**
After completing the course students will able to-

| | |
|---|---|
| CO1 | Identify qualities of entrepreneurs |
| CO2 | Write project proposal |
| CO3 | Use various entrepreneurship models |
| CO4 | Understand various schemes supporting entrepreneurship |
| CO5 | Think creative and innovative |

**Detailed Syllabus:**

| | |
|---|---|
| UNIT-I | Introduction to entrepreneurship, concept of Market Survey |
| UNIT-II | Project report preparation |
| UNIT -III | Introduction to various types of entrepreneurship |
| UNIT-IV | Introduction to import-export |
| UNIT-V | Environmental Protection and social responsibility of entrepreneur, discuss on source of entrepreneurship, Factory visit and meeting with entrepreneur |

**Text Books:**

1. Dr. Gupta and Dr. Srinivasan, *Entrepreneurship development in India*
2. Vasant Desai, *Dynamics of Entrepreneurial Development and Management*
3. Sarugadharan and Resia Begum, *Women Entrepreneurship; institutional support and problems*
4. M.W.Deshpande, *Entrepreneurship of small Scale Industries*
5. D.L. Saxon and RW Smilor (eds), *The Art and Science of Entrepreneurs*


**Reference Books:**

1. Venkateshwara Rao and Udai Pareek,(Eds)*Developing Entrepreneurship*-A Handbook
2. Raja Gopal, Agriculture Business and Entrepreneurship
3. H.Sadhak, industrial development in Backward Regions *in India*
4. Ravi J. Mathai, Rural Entrepreneurship A Frame Work in Development Entrepreneurship -A Handbook

1. **Mapping of Course outcome with program outcomes**

| Corse outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PO 13 | PO 14 | PO 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | | | | |
| CO2 | | | | | | 3 | 3 | | 2 | 3 | | | | | |
| CO3 | | | | | | 3 | 3 | 3 | 3 | 3 | 3 | | | | |
| CO4 | | | | | | | | 3 | 3 | | | | | | |
| CO5 | | | | | | | | 3 | 3 | 3 | | | | | |

**1- LOW2- MEDIUM 3- HIGH**

**Teaching Strategies:**

The teaching strategy is planed through the lectures, activities, expert lectures, visit.

**Teacher's Assessment:** Teacher's Assessment of 10 marks is based on assignment given by faculty on case study writing and preparation of project proposal

| EE3019: Renewable Energy Technology<br>(Open Elective) | |
|---|---|
| **Teaching Scheme**<br>Lectures : 03 Hrs/Week<br>Tutorial : --<br>Total Credits : 03 | **Examination Scheme**<br>Class Test I : 15 Marks<br>Class Test I : 15 Marks<br>Teacher's Assessment : 10 Marks<br>End -Semester Exam : 60 Marks |

**Course Description:**

In this curriculum, students will be explored to Renewable Energy Technologies such as Wind energy, Solar energy. They will be introduced to concepts of fuel cells and biomass energy.

**Course Objectives:**

The objectives of the course are to learn

1. Different types of energy sources
2. Various solar PV technologies and its characteristics
3. Various solar thermal technologies and its applications
4. Wind energy technologies and its operations
5. Grid integration of wind energy systems and its associated issues

**Course Outcomes:**

After completing the course, students will able to

| | |
|---|---|
| **CO1.** | Elaborate different types of energy sources |
| **CO2** | Explain various solar PV technologies and its characteristics and solve numerical on it |
| **CO3** | Describe various solar thermal technologies and its uses in various applications |
| **CO4** | Discuss wind energy technologies and explain its operations |
| **CO5** | Explain grid integration of wind energy systems and its associated issues |

**Detailed Syllabus:**

| | |
|---|---|
| **UNIT-I** | **Basics of Energy:**<br>Energy and Power, Hubert peak, Energy Scenario in India, Environmental impact of fossil fuels, Different types of energy sources - solar, wind, tidal, geothermal, wave energy, Introduction to fuel cells and Biomass |
| **UNIT-II** | **Solar PV Technology:**<br>Amorphous mono-crystalline, poly-crystalline, V-I characteristics, Shading impact, PV module, Array, Maximum Power Point Tracking, Grid connected and standalone systems |
| **UNIT-III** | **Solar Thermal Technology:**<br>Solar Spectrum, Solar Geometry, Sun Earth angles, Solar radiation at given locations, Flat plate collector, Parabolic trough, Central receiver, parabolic dish, Fresnel, solar pond, solar still |

| | |
|---|---|
| **UNIT-IV** | **Wind Energy Technology:**<br>History of wind power, types of wind turbines, power in the wind, Betz limit, Tip speed ratio, stall and pitch control, wind speed statistics, probability distribution, wind generator topologies, voltage and reactive power control, power quality standard for wind turbines |
| **UNIT-V** | **Grid Integration of Wind Energy:**<br>Wind farms, real and reactive power regulation, voltage and frequency operating limits, wind farm behavior during grid disturbances, power system interconnection, Economic aspects |

**Text and Reference Books:**

1. Thomas Ackermann, Editor, "Wind Power in Power Systems", John Willy and sons ltd., 2005,ISBN 0- 470-85508-8.
2. Gilbert M. Masters, "Renewable and Efficient Electric Power Systems", John Willy and sons,2004,ISBN0-471-28060-7.
3. S. P. Sukhatme, "Solar Energy", Tata McGrew Hill, second edition, 1996, ISBN 0-07-462453-9.
4. ChetanSingh Solanki, "Solar Photovoltaics", fundamental, technologies and applications, PHI- second edition, 2011.
5. Siegfried Heier, "Grid integration of wind energy conversion systems" John Willy and sons ltd.2006.
6. Mullic and G.N.Tiwari, "Renewable Energy Applications", Pearson Publications.
7. John A. Duffie, William A. Beckman, "Solar Engineering of Thermal Processes", Wiley Inter science Publication, 1991

**Sample Assessment Table:**

| Assessment Tool | K1+K2+K3 | K1+K2+K3 | K2+K3 | K2+K3 | K4 |
|---|---|---|---|---|---|
| Course outcomes | CO1 | CO2 | CO3 | CO4 | CO5 |
| Class Test 30 Marks | 8 | 7 | 8 | 7 | |
| Teachers Assessment 10 Marks | 2 | 2 | 2 | 2 | 2 |
| ESE Assessment 60 Marks | 12 | 12 | 12 | 12 | 12 |

**Teacher's Assessment:** Teacher's Assessment is based on one of the following-

1. Assignments
2. Models/ Presentations
3. Multiple choice questions test
4. Quiz

| EE4045 : Evolutionary Algorithms for Optimization<br>(Open Elective) | |
|---|---|
| **Teaching Scheme**<br>Lectures : 03 Hrs/Week<br>Tutorial : --<br>Total Credits : 03 | **Examination Scheme**<br>Class Test I : 15 Marks<br>Class Test II : 15 Marks<br>Teachers' Assessment : 10 Marks<br>End -Semester Exam : 60 Marks |

**Course Description:**

This course will cover topics in evolutionary algorithms and their application The field of evolutionary computation tries to address large-scale optimization and planning problems through stochastic population-based methods. It draws inspiration from evolutionary processes in nature.

**Course Objectives:**

The objectives of the course are to

1. To explain the basics of optimization techniques
2. To introduce biology background
3. Explain evolutionary strategies
4. Explain genetic algorithms
5. Explain various evolutionary techniques

**Course Outcomes:**

After completing the course, students will able to

| | |
|---|---|
| **CO1** | Formulate optimization problem |
| **CO2** | Understand the basics of biology terms |
| **CO3** | Understand evolutionary strategies |
| **CO4** | Solve optimization problem by applying genetic algorithm |
| **CO5** | Solve optimization problem using PSO, and other evolutionary method |

| | |
|---|---|
| **UNIT-I** | **Optimization background and terminology:**<br>Gradient optimization methods, sampling methods, linear programming, combinatorial optimization. |
| **UNIT-II** | **Evolutionary Biology background and terminology:**<br>Genotype and phenotype, unit of selection, genes and traits, chromosomes, alleles, diploid and haploid, fitness, mutation and recombination. Selection, variation and landscapes. The strengths and weaknesses of the evolutionary model. Inductive bias.. |
| **UNIT-III** | **Evolutionary strategies:**<br>Evolution in continuous variables. Transformations |

| | |
|---|---|
| **UNIT-IV** | **Genetic Algorithms:**<br>Representation, operators, and standard algorithm. The building block hypothesis and the schema theorem application |
| **UNIT-V** | **Swarm Intelligence:**<br>particle swarm optimization, introduction to other evolutionary algorithms such as ant colony, application |

**Text and Reference Books:**

1. Genetic Algorithms in Search, Optimization, and Machine Learning 1st Edition by David E. Goldberg (Author)
2. Evolutionary Computation: A Unified Approach (MIT Press) Paperback – March 25, 2016 by Kenneth A. De Jong

**Mapping of Course outcome with program outcomes :**

| Course outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PO 13 | PO 14 | PO 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO2 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO3 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO4 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO5 | 3 | 2 | 2 | | 1 | | | | | | | | | | |

**1- LOW2- MEDIUM 3- HIGH**

**Teacher's Assessment:**

Teacher's Assessment is based on one of the following.

1. Assignments
2. Models/ Presentations
3. multiple choice questions test
4. Quiz

| EE4046 : Energy and Environment<br>(Open Elective) | |
|---|---|
| **Teaching Scheme**<br>Lectures : 03 Hrs/Week<br>Tutorial : --<br>Total Credits : 03 | **Examination Scheme**<br>Class Test I : 15 Marks<br>Class Test II : 15 Marks<br>Teacher's Assessment : 10 Marks<br>End -Semester Exam : 60 Marks |

**Course Description:**

In this curriculum, students will be explored to Renewable Energy Technologies such as Wind energy, Solar energy. They will be introduced to concepts of fuel cells and biomass energy.

**Course Objectives:**

The objectives of the course are to learn

1. Discuss energy and environment issues
2. Discuss global and local environment issues
3. Urban energy planning and management
4. Discuss rural energy planning and management
5. Illustrate technological opportunities

**Course Outcomes:**

After completing the course, students will able to

| | |
|---|---|
| **CO1.** | Feel environment policies |
| **CO2** | Identify global and local environment related problems |
| **CO3** | Develop solution for urban energy planning |
| **CO4** | Develop solution for rural energy planning |
| **CO5** | Judge various technological options |

**Detailed Syllabus:**

| | |
|---|---|
| **UNIT-I** | **Energy and Environment basic issues**:<br>Overview of global and local energy and environment scenario and policy, Concept of energy economics, concepts of environment economics, energy-environment– economy linkages, emission assessment and policy relevance integrated assessment of energy and environment: framework and models |
| **UNIT-II** | **Global and Local environmental issues**:<br>overview of global climate changes, clean development mechanism, green buildings, Kyoto protocol, global warming, Effect of various power plants on environment, new instruments for energy and environment policies, Carbon trading |
| **UNIT-III** | **Urban Energy planning and management**:<br>Challenges faced by the urban environment, integration of conventional and renewable energy urban infrastructure, examples of cities or establishments that display sustainable urban environment and energy planning and management. |
| **UNIT-IV** | **Rural energy planning and management:**<br>Integration of non-conventional and renewable energy technology |
| **UNIT-V** | **Technological options:** |

| | |
|---|---|
| | Technology, policies and measures for long –term energy and environment, renewable energy issues and policies. |

**Text and Reference Books:**

1. B.R.Gupta, "Generation of Electrical Energy" S. Chand Publication.
2. S.Rao & Dr.B.B.Parulekar,"Energy Technology: Non-conventional, Renewable and Conventional" Khanna Publishers
3. Frank Kreith and George Burmeister, "Energy Management & Conservation" Amazon Publishers
4. Beggs and Clive, "Energy Management Supply and Conservation" Wall Mart Publishers
5. K.Bhattacharya, MHJ Bollen, J.E.Dalder, "Operation of Restructured Power System" Kluwer Academic Publications
6. Electricity Act 2003
7. Energy Conservation Act 2001 8. Bureau of Energy Efficiency India web-site http://www.bee-india.co

**Mapping of Course outcome with program outcomes:**

| Course outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PO 13 | PO 14 | PO 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO2 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO3 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO4 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO5 | 3 | 2 | 2 | | 1 | | | | | | | | | | |

**1- LOW2- MEDIUM 3- HIGH**

**Teacher's Assessment:**

Teacher's Assessment is based on one of the following.

1. Assignments
2. Models/ Presentations
3. Multiple choice questions test
4. Quiz

| EE4047 : Modeling and Simulation<br>(Open Elective) | |
|---|---|
| **Teaching Scheme**<br>Lectures : 03 Hrs/Week<br>Tutorial : --<br>Total Credits : 03 | **Examination Scheme**<br>Class Test I : 15 Marks<br>Class Test II : 15 Marks<br>Teachers' Assessment : 10 Marks<br>End -Semester Exam : 60 Marks |

**Course Description:**

The course will introduce the basic concepts of computation through modeling and simulation that are increasingly being used by technologist. Students will use MATLAB or similar software to explore a range of programming and modeling concepts while acquiring those skills.

**Course Objectives:**

The objectives of the course are to

1. To explain basic programming skills
2. Describe technical writing
3. Explain the role and history of modeling
4. Describe various types of models
5. Explain the process of simulation

**Course Outcomes:**

After completing the course, students will able to

| | |
|---|---|
| **CO1** | To write program using basic functions |
| **CO2** | Write technical description of model |
| **CO3** | Understand the type of model |
| **CO4** | To form mathematical model of the system |
| **CO5** | To simulate and validate the mathematical model of the system |

| | |
|---|---|
| **UNIT-I** | **Basic programming skills:**<br>functions, arrays, loops, conditional statements, procedures |
| **UNIT-II** | **Technical communication skills:**<br>Create a comprehensive report and an oral presentation with accurate visual representations of a model and its results. |
| **UNIT-III** | **Role of Modeling:**<br>Importance of modeling to science and engineering, the history and need for modeling, the cost effectiveness of modeling, the time-effect of modeling, the terms associated with modeling to science and engineering, industry related examples of modeling in science and engineering |

| | |
|---|---|
| **UNIT-IV** | **Analyze modeling and simulation**:<br>Identify different types of models and simulations, iterative development process of a model, models linking with the physical world, the virtual world and the science of prediction. |
| **UNIT-V** | **Simulation**:<br>Develops a mathematical representation and transforms it to a computational model, their verification and validation, Document the development and implementation of the model and present in oral and written form |

**Text and Reference Books:**


1. Modeling and Simulation: Exploring Dynamic System Behavior (Simulation Foundations, Methods and Applications) Soft cover reprint of the original 2nd ed. 201
2. Introduction to Modeling and Simulation with MATLAB® and Python (Chapman & Hall/CRC Computational Science) 1st Edition


**Mapping of Course outcome with program outcomes:**

| Course outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 | PO 13 | PO 14 | PO 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO2 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO3 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO4 | 3 | 2 | 2 | | 1 | | | | | | | | | | |
| CO5 | 3 | 2 | 2 | | 1 | | | | | | | | | | |

**1- LOW2- MEDIUM 3- HIGH**

**Teacher's Assessment:**

Teacher's Assessment is based on one of the following.

1. Assignments
2. Models/ Presentations
3. Multiple choice questions test
4. Quiz