

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

**BACHELOR OF VOCATIONAL (B.Voc.) PROGRAMME  
SUSTAINABLE ENERGY MANAGEMENT**

**SYLLABUS**

(Effective from the academic year 2016 – 2017)

**FORMS OF ENERGY AND ENERGY CRISIS**

**CODE:16VS/VM/FC16**

**CREDITS: 6**

**L T P: 3 0 3**

**TOTAL TEACHING HOURS: 78**

**OBJECTIVES OF THE COURSE**

- To understand the various forms of energy
- To get an insight of energy crisis and energy conservation practices

**Unit 1 (10hrs.)**

**Forms of Energy**

- 1.1 Introduction – various forms of energy – thermal, sound, light electrical, magnetic, chemical, nuclear, mechanical, Elastic, Gravitational energy
- 1.2 Types of energy sources – Renewable – Non – Renewable sources

**Unit 2 (10hrs.)**

**Energy Consumption and Demand**

- 2.1 Energy consumption – energy consumption(per capita) and economic growth
- 2.2 Global energy consumption – Energy demand – primary energy demand and cumulative energy demand

**Unit 3 (10hrs.)**

**Energy Resources**

- 3.1 Energy routes for non-renewable energy resources – age of renewables and alternatives
- 3.2 Energy developments – energy requirements and future prospects

**Unit 4 (9hrs.)**

**Energy Crisis its Causes and Solutions**

- 4.1 Introduction: Causes of energy crisis: Over consumption, over population, infrastructure Unexplored Renewable Energy Options – Commissioning of Power Plants
- 4.2 Moving toward renewable energy sources – energy conservation practices Technology up gradation and strategies to meet energy requirements

**Unit 5 (39hrs.)**

**Site Analysis: Fundamental Energy Calculations and work place safety**

- 5.1 Energy calculations: units and conversion dimensional equations – Joules, kWh/units

- 5.2 Energy crisis: Global scenario – Energy crisis of developing countries – Report
- 5.3 Energy storage – Various energy storage systems and Energy savings – Comparative study of power consumption in electrical appliances
- 5.4 Basic First aid & Safety at work place

### **BOOK FOR STUDY AND REFERENCE**

Rao. S and Parulakar . B.B, Energy Technology, New Delhi: Khanna Publishers, 1997

Sastri . M.M., *Energy Sources, resources and options*, Mumbai: Himalaya Publishing House, 1994

Thipse. S.S. *Non- Conventional and Renewable energy sources*, New Delhi: Narosa Publishing House, 2014

### **PATTERN OF EVALUATION**

**Continuous Assessment: 25 marks**

**End Semester: 75 marks**

The students will be taking one C.A. test and additional Skill sets training practical component which may include practical work, assignments, project work, any other.

**I. C.A. Test for 3 hours 50 marks**, comprising of Theory (25marks) and Practical (25marks), both to be done in the laboratory. **The final marks to be converted to 25**

C.A. Test Pattern for theory: (25marks)

Section A – Objective/ definition/ fill in the blanks- 10 x 1 = 10 marks (to be collected after 10 minutes)

Section B – 3 out of 5 - 3 x 3 = 9 marks

Section C – 1 out of 2 - 1 x 6 = 6 marks

Practical: 25 marks

**II. Continuous Assessment of Skill sets training - practical work: 25 marks** – Aggregate of all practical assessment

**End Semester Examination (Total 100 marks to be converted to 75 marks)**

Total Marks: 100

Duration: 6 hours

Theory: 50 Marks

Practical: 50 Marks

(Both theory and practical to be done in the laboratory).

**Pattern for Theory: 50 marks**

Section A – Objective/ definition/ fill in the blanks- 20 x 1 = 20 marks (to be collected at the end of 20 minutes)

Section B – 6 out of 10 - 6 x 3 = 18 marks

Section C – 2 out of 4 - 2 x 6 = 12 marks

**Practical: 50 marks**

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**BACHELOR OF VOCATIONAL (B.Voc.) PROGRAMME  
SUSTAINABLE ENERGY MANAGEMENT**

**SYLLABUS**

(Effective from the academic year 2016 – 2017)

**SOLAR ENERGY**

**CODE:16VS/VM/SE16**

**CREDITS: 6**

**L T P: 3 0 3**

**TOTAL TEACHING HOURS: 78**

**OBJECTIVES OF THE COURSE**

- To understand various concepts in utilization of Solar energy
- To learn the merits of solar energy for variety of applications

**Unit 1 (10hrs.)**

**Introduction to Solar Energy**

- 1.1 Fundamentals of Solar Radiation – The Nature of Solar Radiation – Radiation on Earth's Surface – Sun path Chart
- 1.2 Historical Perspective - Solar Energy; Obstacles and Outlook - Global and Indian solar energy scenario - Potential and power generation

**Unit 2 (10hrs.)**

**Solar energy conversion**

- 2.1 Photovoltaics - Principles - Physics and operation of solar cells
- 2.2 Solar panels - Solar power plants
- 2.3 Various parameters and work safety for solar PV installation

**Unit 3 (10hrs.)**

**Solar collectors**

- 3.1 Fundamentals of solar collectors as devices to convert solar energy to heat. Design and structure of collectors for heating liquids and air.
- 3.2 Solar concentrating collectors - Sun tracking mechanisms – Solar mapping

**Unit 4 (9hrs.)**

**Applications**

- 4.1 Solar thermo-mechanical refrigeration system-Solar systems for process heat production – Solar cooking – Performance and testing of solar cookers – Power generation - drying
- 4.2 Solar pond – Solar greenhouse – Solar Pumping – Solar Distillation

**Unit 5 (39hrs.)**

**Case Study**

- 5.1 Solar panel experiment and study of Solar photovoltaic cells-IV characteristics.
- 5.2 Solar energy spectrum calculation of Rydberg's constant.
- 5.3 Solar cell fabrication.

## BOOKS FOR STUDY AND REFERENCE

Agarwal. *Solar Energy*., New Delhi: S.Chand & Company Ltd., 1983

Thipse S.S. *Non-Conventional Energy and Renewable Energy Sources*, Narosa Publishing House, 2014

Garg H.P. Prakash J. “*Solar Energy Fundamentals and Applications*”, Tata McGraw-Hill, 2005.

B. H. Khan. *Non-Conventional Energy Resources*, Second Edition. Tata McGraw Hill Education Private Limited, 2012.

G.D. Rai, *Solar Energy Utilization*, 5th edition. Khanna Publishers, 2010.

Sukatme. *Solar Energy*, Tata McGraw Hill Publishing company Ltd., 1996.

## PATTERN OF EVALUATION

### Continuous Assessment: 25 marks

### End Semester: 75 marks

The students will be taking one C.A. test and additional Skill sets training practical component which may include practical work, assignments, project work, any other.

**I. C.A. Test for 3 hours 50 marks**, comprising of Theory (25marks) and Practical (25marks), both to be done in the laboratory. **The final marks to be converted to 25**

C.A. Test Pattern for theory: (25marks)

Section A – Objective/ definition/ fill in the blanks- 10x1=10 marks (to be collected after 10 minutes)

Section B – 3 out of 5 - 3 x 3 = 9 marks

Section C – 1 out of 2 - 1 x 6 = 6 marks

### Practical: 25 marks

**II. Continuous Assessment of Skill sets training - practical work: 25 marks** – Aggregate of all practical assessment

### End Semester Examination (Total 100 marks to be converted to 75 marks)

Total Marks: 100

Duration: 6 hours

Theory: 50 Marks

Practical: 50 Marks

(Both theory and practical to be done in the laboratory).

### Pattern for Theory: 50 marks

Section A – Objective/ definition/ fill in the blanks- 20 x 1=20 marks (to be collected at the end of 20 minutes)

Section B – 6 out of 10 - 6 x 3 = 18 marks

Section C – 2 out of 4 - 2 x 6 = 12 marks

### Practical: 50 marks

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**BACHELOR OF VOCATIONAL (B.Voc.) PROGRAMME  
SUSTAINABLE ENERGY MANAGEMENT**

**SYLLABUS**

(Effective from the academic year 2016 – 2017)

**ENERGY ECONOMICS**

**CODE:16VS/VA/EE15**

**CREDITS: 5**

**L T P: 5 0 0**

**TOTAL TEACHING HOURS: 65**

**OBJECTIVES OF THE COURSE**

- To develop in the students an awareness of the basic issues and problems relating to the Energy Economics
- To help in critically analysing the energy market in the Indian context

**Unit 1**

**Introduction to Micro Economics Concepts (13hrs.)**

- 1.1 Supply and Demand – Applying supply and demand - elasticity
- 1.2 Consumer theory – Preference and utility- Budget Constraints- Deriving Demand Curve
- 1.3 Producer Theory – Productivity and costs - competition
- 1.4 Monopoly and Oligopoly
- 1.5 Equity and Efficiency

**Unit 2**

**Introduction to Sustainable Energy (13hrs.)**

- 2.1 Historical Context – post industrialization- growth of the developed countries and growing energy needs of less developed countries
- 2.2 Overview of energy use and related issues
- 2.3 Global climate change issues and responses – Greenhouse gas emissions and potential effects – effect on ecology and biodiversity- Responses to CO<sub>2</sub> build up – Mitigation – Policy – Carbon tax- Command and Control
- 2.4 Sustainability, energy and clean technologies – Sustainability attributes- population and consumption growth – Tradeoffs and choices- Uncertainty

**Unit 3**

**Energy Decision, Markets (13 hrs.)**

- 3.1 Natural Gas – Introduction to Natural gas markets- Future
- 3.2 Electricity, Coal, Renewable Energy, Nuclear power – Prospects and Future

**Unit 4**

**Energy Policies (13 hrs.)**

- 4.1 Future of global energy, Climate Change - Understanding public complacency
- 4.2 Energy supply and economics of depletable resources, Energy Security – Clean Energy – Energy paradox

- 4.3 Pollution Control
- 4.4 Public Policies- Indian Environmental Policies – Social Movements – energy efficiency policies – renewable energy policies – Regulations- Emission trading

**Unit 5 Energy Management & Case Study (13 hrs.)**

- 5.1 Energy use by individuals and households – energy calculator – energy consumption
- 5.2 Industry Power management

**BOOKS FOR REFERENCE**

Banks F.E. *Energy Economics: A Modern introduction*, Kluwer Academic Publishers Dordrecht 2000.

Griffin J.M. and H.B. Steele. *Energy Economics and Policy*, Academic, Orlando, 1986

Hussen. Ahmed.M. *Principles of Environmental Economics: Economics, Ecology and Public Sector*. London: Routledge.1999.

Kolestad. Charles D. *Environmental Economics*, New York: Oxford University Press. 2000.

Singh, Katar. And Shishodia. Anil. *Environmental Economics: An Indian Perspectives*. New Delhi: Oxford University Press. 2007.

**PATTERN OF EVALUATION**

**Continuous Assessment: 25 marks**

**End Semester: 75 marks**

The students will be taking one C.A. test and additional Skill sets training component which may include activities, case studies, assignments, project work, any other.

**I. C.A. Test for 1 ½ hours 50 marks**, comprising of only Theory. To be converted to 25

**C.A. Test Pattern:**

Section A – Objective/ definition/ fill in the blanks- 15x1=15 marks (to be collected after 15minutes)

Section B – 3 out of 5 - 3 x 5 = 15 marks

Section C – 1 out of 2 - 1 x 20= 20 marks

**II. Continuous assessment of skill sets activities, Assignment, Quiz etc.: 25 marks**

**End Semester Examination (Total 100 marks will be converted to 75 marks)**

Total Marks: 100

Duration: 3 hours

Section A – Objective/ definition/ fill in the blanks- 30 x 1=30 marks (to be collected after 30 minutes)

Section B –6 out of 8 - 6 x 5 = 30 marks

Section C –2 out of 4 - 2 x20 = 40 marks