

UNIVERSITY OF MUMBAI

No. UG/208 of 2010

CIRCULAR :-

A reference is invited to the Ordinances, Regulations and syllabus relating to the T.Y.B.Sc. degree course vide Pamphlet No.151 and the Principals of the affiliated Colleges in Science are hereby informed that the recommendation made by the Board of Studies in Physics at its meeting held on 11th May, 2010 has been accepted by the Academic Council at its meeting held on 10th June, 2010 vide item No.4.40 and that, in accordance therewith, the syllabus of Applied Component Paper 'Solar and Applied Energy Resources' at the T.Y.B.Sc. Examination is as per Appendix and that the same has been brought into force with effect from the academic year 2010-2011.

MUMBAI-400 032
21st July, 2010

L. R. Mane
Offg. Registrar

To,

The Principals of the affiliated Colleges in Science.

A.C./4.40/10/06/2010

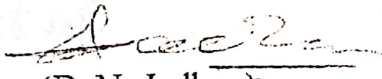
No. UG/208 -A of 2010,

MUMBAI-400 032

21st July, 2010

Copy forwarded with compliments for information to:-

- 1) The Dean, Faculty of Science,
- 2) The Chairman, Board of Studies in Physics,
- 3) The Controller of Examinations,
- 4) The Co-Ordinator, University Computerization Centre,


(D. N. Jadhav)
Ag. Deputy Registrar
(UG/PG Section)

Copy to :-

The Director, Board of College and University Development, the Deputy Registrar (Eligibility and Migration section), the Director of Students Welfare, the Executive Secretary to the Vice-Chancellor, the Vice-Chancellor, the Registrar and the Assistant Registrar, Administrative sub-center, Ratnagiri for information.

The Controller of Examinations (10 copies), the Finance and Accounts Officer (2 copies), Record Section (3 copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (3 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanagari (2 copies), the Deputy Registrar, Affiliation Section (2 copies), the Professor-cum- Director, Institute of Distance Education, (10 copies) the Director University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar, (P&RO) the Assistant Registrar, Academic Authorities Unit (2 copies) and Assistant Registrar, Executive Authorities Unit (2 copies). They are requested to treat this as action taken report on concerned resolution adopted by the Academic Council referred to in the above circular and that on separate Action Report will be sent in this connection. The Assistant Registrar Constituent Colleges Unit (2 copies), BUCT (1 copy), the Deputy Account, Unit V (1 copy), the In-charge Director, Centralize Computing Facility (1 copy), the Secretary, MITASA (1 copy), the Superintendent, Post-graduate



UNIVERSITY OF MUMBAI



**Revised Syllabus
for
Applied Component
(Solar and Applied Energy Resources)
at the
T.Y.B. Sc.
in the Subject of
Physics**

(with effect from the academic year 2010 - 2011)

University of Mumbai
T Y B Sc (6 Unit or 3 Unit course)

Applied Component:
Solar and applied Energy Resources

Revised syllabus in the subject of **Applied Component: SOLAR AND APPLIED ENERGY RESOURCES** for the Third Year B Sc (Single / Double major subjects) will implemented from the academic year **2010-2011**.

A student has to offer one Applied Component (AC) and it will have **TWO** papers carrying 60 marks each. Syllabus in each paper will be divided into 4 Units and it will be taught by 60 periods of 48 minutes duration each.

Scheme of Examination
Applied Component: ~~NON-CONVENTIONAL~~^{Solar} ENERGY RESOURCES

Paper	Title	Marks
Paper- SAE-I	Fundamental of Energy and Solar Energy	60
Paper-SAE-II	Applied Energy Resources	60
	Total A	120
Practicals	Practical paper- SAEP- I	30
	Practical Paper- SAEP-II	30
	Certified Journal	10
	Viva-voce	10
	Total B	80
	Total A + B	200

N.B.

- Duration of the each Theory paper will be 3 Hours.
- Duration of each Practical paper will be 3 Hours.
- A certified journal of Solar and Applied Energy Resources must contain a minimum of 16 Experiments with at least 8 from each practical paper.
- Every candidate will be required to perform two experiments, one each from each practical paper.
- A candidate will be allowed to appear for the Practical Examination only if the candidate submits his/her certified journal from the Head of Department of Physics/Institute, stating that the candidate has performed and completed the practical of Non Conventional Energy Resources as per the requirements in syllabus.
- Each theory paper shall consist of 5 (Five) questions, one per unit with internal choice and one question with questions from all four units.
- Two periods per week per theory paper and four periods per week per practical batch are to be allocated in the work load

University of Mumbai
T Y B Sc (6 Unit or 3 Unit course)
Applied Component
Solar and Applied Energy Resources

Paper I: Fundamental of Energy and Solar Energy (L-15)

Unit-I

Fundamental of Energy – Science and Technology: Classification of Energy Resources, Importance of Non-Conventional Energy Sources, Advantages and disadvantages of conventional Energy Sources, Environmental Aspects of Energy, World Energy status, Energy scenario in India.

Energy conversion: Salient Features of Energy Conversion Act 2001, Various Aspects of Energy Conversion, Principle of Energy Conversion, General Electrical Energy Conversion Opportunities, Combined Cycle Plants.

Energy storage: Necessity of Energy Storage, Energy Storage methods

Ref-BHK: Chapter 1: 1.3, 1.5, 1.8, 1.10, 1.13, 1.14; **Chapter 2:** 2.1, 2.2, 2.3, 2.4, 2.5, **Chapter 3:** 3.1, 3.2

Unit -II

Solar Energy-Basic: The sun as a Source of Energy, The Earth, Sun, Earth Radiation Spectrum, Extraterrestrial and Terrestrial radiations, Spectral energy distribution of Solar Radiation, Depletion of Solar Radiation, Measurements of Solar Radiation, Solar Radiation Data, Solar Time, Solar Radiation geometry, Solar Day Length, Empirical Equation for Estimating Solar Radiation, Hourly Global, Diffusion and Beam Radiation on Horizontal surface under cloudless Skies, Solar Radiation on Inclined plane Surface.

Ref-BHK: Chapter 4: 4.1, to 4.14,

Unit- III

Solar Thermal System: Solar collectors, Solar Water Heater, Solar Passive Space-Heating and Cooling Systems, Solar Industrial Heating Systems, Solar Refrigeration and Air-Conditioning Systems, Solar Cookers, Solar Furnaces, Solar Green House, Solar Dryers, Solar Distillation, 5.11 Solar Thermo-Mechanical Systems.

Ref-BHK: Chapter 5: 5.1 to 5.11

Unit-IV

Solar Photovoltaic System: Solar cell Fundamentals, Solar Cell Characteristics, Solar cell Classification, Solar Cell Module Panel and Array Construction, Maximum the Solar PV Output and Local Matching, Maximum Power Point Tracker, Balance of System Components, Solar PV System, Solar PV Applications.

Ref-BHK: Chapter6: 6.1 to 6.9

Practicals:

1. Study of solar cell: Solar radiation measurement using lux meter
2. Study of effect of intensity variation on efficiency of solar cell
3. Spectral response of solar cell
4. Solar dryer: Construction and performance
5. Thermal efficiency of parabolic collector/ Reflector
6. Flat plate collector: Construction and Thermal collection
7. Photovoltaic Cell: I-V characteristics, O/P variation with temperature
8. Scaffler Disc (Reflector)
9. Study of various energy units and their conversions.
10. Study of charging and discharging of chemical storage batteries.
11. Use and study of solar cooker
12. Solar cell array construction

Optional:

Projects:

1. Solar radiation and local time
2. Solar distillation plant
3. Solar power incident on earth surface with respect to sun ray
4. Sun tracking

Field visits:

1. Visit to Thermal power / Hydro power stations
2. Visit to thermal cooking station like Shirdi, Mount Abu, etc.
3. Demonstrations of the experiments related to the topics are encouraged.

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T Y B Sc- Physics (6 Unit or 3 Unit course)
Applied Component
Solar and Applied Energy Resources

Paper II: Applied Energy Resources

Unit-I

Wind Energy: Origin of Winds, Nature of Winds, Wind Turbine Siting, Major Applications of Wind Powers, Basics of Fluid Mechanics, Wind Turbine Aerodynamics, Wind Turbine type and Their Conversion, Wind Energy Conversion Systems, Wind- diesel Hybrid System, Effects of Wind Speed and Grid Condition, Wind-Energy storage, Environmental Aspects, Wind-Energy Programme in India. (L-15)

Ref-BHK: Chapter 7: 7.1 to 7.13

Unit-II

Biomass Energy: Photosynthesis Process, Usable Forms of Biomass their Composition, Biomass Resources, Biomass Conversion Technology, Urban Waste to Energy Conversion, Biomass Gasification, Biomass Liquefaction, Biomass to Ethanol Production, Biogas Production from Waste Biomass, Energy Farming, Biomass Energy Programme in India. (L-15)

Ref-BHK: Chapter 8: 8.1 to 8.11

Unit -III

Geothermal Energy: Applications, Origin and Distribution of geothermal Energy, Types of Geothermal Resources, Analysis of Geothermal Resources, Exploration and Development of Geothermal Resources, Environmental Consideration, Geothermal Energy in India. (L-15)

Ocean Energy: Tidal Wave, Wave Energy, Ocean Thermal Energy

Ref-BHK: Chapter 9: 9.1 to 9.7; Chapter 10: 10.1 to 10.3

Unit- IV

Small Hydro Resources: Advantage and Disadvantage of Small Hydro Schemes, Layout of Macro Hydro schemes, Water Turbines, Turbine Classification, Characteristics and Selection, Generations, Present status. (L-15)

Emerging Technologies: Fuel Cell, Hydrogen Energy.

Miscellaneous Non-Conventional Technologies: Magneto Hydrodynamics, Thermo electrical Power Conversions, Thermionic Power Conversions.

Ref-BHK: Chapter 11: 11.1 to 11.6; Chapter 12: 12.1 to 12.2; Chapter 13: 13.1 to 13.3

Practicals:

1. Wind data measurement and analysis (power)
2. Measurement of wind velocity (Air Blower, Anaemometer)
3. Caloric values of fuel (coal, coke wood and charcoal)
4. Study of heat storage: construction and calibration
5. Wind mill models: Construction and comparison of their efficiency
6. Low coast Anaemometers: Construction and calibration
7. Measurement of solar radiation (Lux meter)
8. Determination of thermal energy of hot water system
9. Construction and Study of different small scale wind turbine blades for angular velocity, power conversion efficiency, inertia, cost of construction etc.
10. Study of DC motor/generator.
11. Calorific value of various biomasses.
12. Study of potential energy of water storage with reference to height and amount of storage.

Optional:

Projects:

- 1 Study of Biogas plant
- 2 Study of energy cycle on earth
- 3 Financial Economical Evaluation- Use of PC (Ref: Chapter-14 B H Khan)

Field visits:

1. Visit to The wind farm
2. Visit to the energy village / School of energy studies
3. Demonstrations of the experiments related to the topics are encouraged.

Reference:

Theory:

4. **BHK:** B H Khan- Non-Conventional Energy Resources
(Second Edition)
Publisher: Tata McGraw-Hill Education Pvt Ltd New Delhi
Year 2009
2. **RM:** R Morgan R B Murry- Energy Resources J T MacMillan
3. **HPG:** H P Garg - Solar Energy, Fundamental and Application, Tata
McGraw Hill New Delhi

Practical:

1. Chetan Singh Solanki- Renewable energy Technologies (A Practical Guide for Beginners) PHI Learning Pvt Ltd New Delhi

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