Performa of information to be collected for University department for uploading on University website.

1. **Name of the Department/Section:** Department of Electrical and Other Energy sources, College of Agricultural Engineering and Technology, Dr. Balasaheb Sawant Krishi Vidhypeeth, Dapoli.
2. **About Department**(About Department HISTORICAL PERSECTIVE OF THE DEPARTMENT):

   The Department of Electrical and Other Energy Sources, is the prime part of faculty of Agricultural Engineering, Dapoli. In this department academic courses of under graduate Post graduate and Doctorate are conducted.
3. **Academic Programmers: Provided the details of each doctorial programme as**
   a. **Doctorial Programmes**

   Name of the Programme: Ph.D (Renewable Energy)

Semester No.	Term No.	Course No.	Credits	Title of the course offered by the department
I	1st	RES - 609	3(2+1)	Solar energy utilization
		RES - 601	3(2+1)	Advances in alternative energy sources
		RES - 621	3(2+1)	Solid waste and waste water treatment
II	2nd	RES - 603	3(2+1)	Bio and thermo chemical conversion of wastes
		RES - 602	3(2+1)	Solar and wind energy system analysis
		RES - 521	3(2+1)	Energy management in food process industry
		RES – 622	3(2+1)	Design and analysis of renewable energy conversion systems
III	1st	PGS – 506	1(1+0)	Disaster management
		RES – 693	1(0+1)	Special Problem
		RES - 693	1(0+1)	Case Study
		RES - 691	1(0+1)	Doctoral Seminar I
		RES - 692	1(0+1)	Doctoral Seminar II
IV	2nd	RES - 699	45(0+45)	Doctoral Research

Course Curricula and syllabi:

RES 521 ENERGY MANAGEMENT IN FOOD PROCESSING INDUSTRIES 3(1+2)

Theory

UNIT I

Energy forms and units, energy perspective, norms and scenario; energy auditing, data collection and analysis for energy conservation in food processing industries.

UNIT II

Sources of energy, its audit and management in various operational units of the agro-processing units; passive heating, passive cooling, sun drying and use of solar energy, biomass energy and other non-conventional energy sources in agro-processing industries.

UNIT III

Reuse and calculation of used steam, hot water, chimney gases and Cascading of energy sources. Energy accounting methods, measurement of energy, economics of energy use.

Practical

Study of energy use pattern in various processing units i.e., rice mills, sugar mills, dal mills, oil mills, cotton-ginning units, milk plants, Agro-processing food industries etc. Energy audit study and management strategies in food processing plants. Identification of energy efficient processing machines. Measurement and assessment of overall energy consumption, production and its cost in food processing plants, visit to related food processing industry.

Suggested Books

1. Pimental D. 1980. Handbook of Energy Utilization in Agriculture. CRC Press.
2. Rai GD. 1998. Non-conventional Sources of Energy. Khanna Publ.
3. Twindal JW & Anthony D Wier 1986. Renewable Energy Sources. E & F. N. Spon Ltd.
4. Verma SR, Mittal JP & Surendra Singh. 1994. Energy Management and Conservation in Agricultural Production and Food Processing. USG Publ. & Distr., Ludhiana.

PGS 506 DISASTER MANAGEMENT 1+0=1 (e-Course)

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches,

Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

Suggested Readings

Gupta HK. 2003. Disaster Management. Indian National Science Academy. Orient Blackswan.

Hodgkinson PE & Stewart M. 1991. Coping with Catastrophe: A Handbook of Disaster Management. Routledge.

Sharma VK. 2001. Disaster Management. National Centre for Disaster Mgt. India.

RES-609 SOLAR ENERGY UTILIZATION 3(2+1)

Theory:

UNIT I

Characteristics of the sun, the solar constant, Electromagnetic energy spectrum. Extra terrestrial radiation. Solar radiation on the earth surface, beam and diffuse radiation absorption and scattering. Basic earth sun angles, Derived solar angles. Determination of solar time, sunrise, sunset and day length.

UNIT II

Solar flux and weather data, solar radiation. Solar data and estimation of avg. solar radiation, estimation of hourly radiation from daily data, ratio of beam and total radiation on tilted surface to that on horizontal surface.

UNIT III

Heat and mass transfer in solar energy utilization, conduction, convection and thermal radiation, problem related to heat exchanger and still, fin efficiency . Steffen-Boltzman formula, heat transfer between gray surfaces, sky radiation, radiation heat transfer coefficient, reflectivity, transitivity, transmittance absorptance product, selective surfaces and solar system materials.

UNIT IV

Flat plate collectors: Description, theory , heat capacity effect, time constant measurement of thermal performance . Evacuated thermal collector one axis and two axis, solar tracking concentrators, CPC, central receiver collector, sensible heat and latent heat storage, chemical energy storage system, F chart method utility. Flow chart method, (0) method.

UNIT V

Solar energy application: solar cooking solar heating. Drying Cooling and refrigeration. Solar architecture, photovoltaic conversion, SPV powered systems, solar distillation, Absorption cooling solar refrigeration.

UNIT VI

Solar thermal power generation, paraboloidal concentrating systems, cylindrical concentrating system, central receiver system.

Practicals:

Practicals on UNIT-II, UNIT-VI

RES – 601 ADVANCES IN ALTERNATIVE ENERGY SOURCES 3(2+1)

Theory:

UNIT I

Hydrogen production- water splitting –electrolytic methods chemical cycle-photo splitting-photo galvanic –photo chemicals. Tidal energy –operating mode-overfilling of the basins Energy content.

UNIT II

Ocean thermal energy cycle(OTEC)- Baseline design- heat design-power cycle design,-plant working. Energy-commercialization-problem and opportunities. Geo system- classification-convective and conductive system-binary cycle conversion-waterfed heat pumps –electric generation-steam generation - steam field.

UNIT III

Nuclear power systems- light water reactor-high temperature gas reactors- liquid metal fast breeder reactor-Thermal –fuel elements- Types-operation-reactivity coefficient-positioning fuel requirements.

UNIT IV

Fuel cell-general systems-reaction-Gibbs rule of formation internal cell voltage-types of fuel-design of fuel cell systems-applications-conversion-problems.

Thermoelectric convertor-thermionic convertors-magneto Hydra Dynamic system (MHD) Electrogas dynamics (EGD) principle-types.

Practicals:

Testing of electrolysis plant-plant-photo electric plant-photo plant –preparation of flow diagram for tidal energy-OTEC system –Geothermal –nuclear energy storage devices-sensible heat storage- heat storage-fly weel storage-batteries-problems on comparison of fuel efficiencies.

RES –622 DESIGN AND ANALYSIS OF RENEWABLE ENERGY CONVERSION SYSTEMS 3(2+1)

Theory:

UNIT I

Energy cycle of the earth; water flow and storage; ocean currents and tides. Energy heat flow and energy storage; photosynthesis and biomass; renewable energy sources.

UNIT II

Thermodynamics of energy conversion; conversion of solar energy, wind energy, water flows, heat, biomass, etc.; other conversion processes.

UNIT III

Development and use of biogas, alcohols and plant oils, plant oil esters in I.C.engines. Study of various parameters for measuring the performance of the output.

UNIT IV

Design of bio-fuel production units: design of gasifiers, gas flow rates, biogas plants. Establishment of esterification plant, fuel blending.

Practicals:

Designing problems related to renewable energy conversion systems.

Suggested Books

1) Boyle Godfrey. 1996. Renewable Energy: Power for Sustainable Future. Oxford Univ. Press.

2) Culp AW. 1991. Principles of Energy Conservation. Tata McGraw Hill. Duffle JA & 3) Beckman WA. 1991. Solar Engineering of Thermal Processes. John Wiley.

4) Garg HP & Prakash J.1997. Solar Energy - Fundamental and Application. Tata McGraw Hill.

5) Grewal NS, Ahluwalia S, Singh S & Singh G. 1997. Hand Book of Biogas Technology. Solar Energy Fundamentals and Applications. TMH New Delhi.

6) Mittal KM. 1985. Biomass Systems: Principles & Applications. New Age International.

RES-621 SOLID WASTE AND WASTE WATER TREATMENT 3(2+1)

Theory:

UNIT I

Anaerobic lagoons-anaerobic digestion-contact and filter digestion- energy production by digester, and non homogeneous reactions- reactors- physical and chemical removal of dissolved materials.

UNIT II

Gas transfer mass models bubble aeration film flow oxygen transfer stripping-solids removal. Discrete particle-sedimentation and thickening.

UNIT III

Activated- sludge and Other suspended culture processes parameters- mass transfer limitations on removal rate-activated sludge- biosorption of contact stabilization. Biological film flow processes.

UNIT IV

Sanitation land fill- municipal and compost treatment- predigestion of waste- method of biogas.

Practicals

Design principle in waste treatment –equipment specification instrumentation-typical layout of effluent treatment – mathematical modeling of BOD and COD reduction rate- recovery by batch distillation – fluidized bed scrubber- settling experiment- tube- settler configurations- heat and solid removals in depth filter.

Suggested Books

Kreith F & Techobanoglous G. 2002. Hand book of solid waste management, McGraw Hill.

Ramachandra TV. 2006. Management of Municipal solid waste. Capital Publ. Co.

b. Masters Programmes

Name of the Programme: M.Tech.(Renewable Energy)

Semester No.	Term No.	Course No.	Credits	Title of the course offered by the department
I	1st	RES-501	3(2+1)	Renewable Energy Sources
		RES-507	3(2+1)	Agricultural Waste And Byproduct Utilization
		RES-510	3(3+0)	Energy, Ecology And Environment
II	2nd	RES-503	3(2+1)	Biomass Energy Conversion
		RES-504	2(1+1)	Wind Energy Utilization
		RES-506	3(3+0)	Design And Analysis Of Renewable Energy Conversion System
		RES-521	3(2+1)	Energy Management In Food Processing Industries
III	1st	RES-509	2(1+1)	Biogas Technology And Appliances
		RES-592	1(0+1)	Special Problem
		PGS-506	1(1+0)	Disaster Management
		RES-591	1(0+1)	Master Seminar
IV	2nd	RES-509	20(20+20)	Master Research

Course Curricula and syllabi:

RES-501 * Renewable Energy Sources 3(2+1)

UNIT 1

Solar energy solar radiation. radiation exchange process. solar collection. thermosyphon effect; solar applications; direct and indirect heating, cooling, refrigeration. drying, dehydration. Sterilization; Pasteurization; cooking; power generation, biological conversion of solar energy;

UNIT II

greenhouse agriculture, performance evaluation, economics of solar energy systems, solar energy materials & energy storage.

UNIT III

Energy from biomass and wastes; Production, distribution, sources, plant, human animal and municipal waste, properties, composition, treatments, recycling, anaerobic digestion; crop residues and animal waste digestion, biogas;

UNIT IV

producer gas engines. Liquid fuels; Ethanol, methanol, anaerobic and aerobic fermentation, Wind energy; velocity and power duration curves, wind mill parameters, power, torque characteristics; design and performance of rotors, wind mill structure design; solar pv systems.

Practical

Calorific value estimation of biogas and producer gas, Design and benefit analysis of community biogas plant, Measurement of heat balance over a flat plate collector, Solar powered refrigeration system. Natural convection and forced convection solar dryers. Conduction, convection, radiation efficiency measurement- simulated anaerobic studies. Solid state fermentation. Study of ethanol and methanol plants, solar pv characteristics.

Suggested Reading

1. Culp, A.W. (1991) Principles of Energy Conversion, McGraw Hill pub. Co Inc.

2. Odum. H.T. and Odum, E.C. (1976) Energy Basis For Man and Nature. Mc Graw, Hill Pub.Co.Inc.
3. Garg, H.P. and Praksh J. (1976) Solar Energy- Fundamentals and Applications. Tata Mc Graw, Hill pub.Co.Inc.
4. Sukhatmes,S.P. (1997) Solar Energy- Principles of Thermal Collection and Storage 2/e Tata Mc Graw Hill. pub. Cp. Ltd.New Delhi.
5. Duffie, J.A. and Beckman W.A. (1991) Solar Engineering of Thermal Processes. John Willey, New York.
6. Twidell, J.W. & Weir, A.D. (1986) Renewable Energy Sources, E & FN Spon Ltd. London.
7. Rai G.D. (2001) Non Conventional Energy Sources, Khanna Publishers, Delhi.

RES-503* Biomass Energy Conversion 3(2+1)

UNIT I

Biomass Production : Introduction photosynthesis and conversion of solar energy into biomass. Wastelands classification and their use through energy plantation. Selection of species, woody shrubs, nursery raising, handling of seedlings. Methods of field preparation and their merits / demerits, transplanting. Harvesting of biomass and copicing characteristics.

UNIT II

Biomass conversion: Methods of conversion of biomass into solid, liquid and gaseous fuels. Preprocessing of biomass. Advantages and disadvantages of preprocessing. Mechanical equipments such as saw, earthen and metallic kiln, etc. Raw material/biomass feed stock. Bio conversion of substrates in to alcohols, organic acids, solvents amino, acids, antibiotics. Bio, photosynthesis Primary product and byproducts Biomass characterization. Ultimate and proximate analysis of biomass.

UNIT III

Biomass conservation: Biomass conservation techniques and their principles such as improved chullha, briquetting of loose biomass etc.

Thermo, chemical conversion : Thermochemical conversion of biomass through direct combustion, pyrolysis and gasification. Sterling engine, gasifier fired dual fuel engine, chemical conversion process. hydrolysis and hydro generation. solvent extraction of hydro carbons.

Practical

study of different gasifiers. Thermal efficiency of burners & I.C. engine run on producer gas, design of heat exchanger, study of charcoal preparation.

Suggested Reading

1. Energy from Biomass O.P. Vimal Agrcole Publishing Academy, New Delhi
2. Renewable energy sources.J.W. Twidell and AD weir E & N Spon, New York.
3. Bio Energy Resources : Planning, Production and Utilization. Pradeep Chaturvedi, Concept Pub.Co New Delhi. 59 (1995)
4. Biogas Technology & other Alternative Technologies, A. Chakravorty, Oxford & IBH Publication Ltd, Delhi 1985.
5. Alternative energy in Agriculture, Vol. II D.Y. Goswami (Ed) CRC, Press Inc. Florida,USA 1986.
6. Biomass energy profiles, FAO Agril. Services Bulletin No.54,1984 B.A. Stout.

RES-504* Wind Energy Utilization 2(1+1)

UNIT I

Wind Energy: Introduction, history of development, application of wind energy, wild velocity, wind mapping, minimum, maximum and averaging.

Wind power: Power produced due to wind current, effect of height, obstacle and valley. Criteria for selection of site for wind power harnessing.

UNIT II

Wind power equipment such as pumps, generators, Storage of wind energy, wind power plant and supply of wind power of consumer/grid.
Wind measuring, instruments and controls: Different systems of measuring and recording wind velocity, wind tower, controls used in wind machines.

UNIT III
Wind Machines: Type of wind mills, Systems of wind machines, different parts such as rotor, structure, plunger, tod and their design. Different power transmission systems and design. Wind blade and its configurations, forces on wind blade, drag and lift, load matching, speed range selection. Selection of material for different parts.

Practical
Wind velocity maps, analysis, design of wind mills, study of wind generators, survey of wind generation sites.

Suggested Reading

1) H.G. More and R.C. Maheshwari; Wind Energy Utilization in India, Technical Bulletin No.CIAE/82/38,CIAE, Bhopal
2) Lysen, E. Introduction to Wind Energy.
3) Veziroglue, Najat, T; Alternate Energy Sources. Vol. IV Indirect Solar Energy.
4) Fundamental of Wind Energy: N.P. Cheremisionoff , ANN ARBOR SCIENCE, Pub. Inc. Michigan. 1978.
5) Frank R. Eldridge (1980), Wind Machines Van Nostrand Reinhold Co. New York.
6) Lipman N.H., Muggrove P.J., Pontin, G.w., W, (1982), Wind Energy for the Eighties, Peter Peregrinus Ltd. Stenvenage, New York

RES-506 Design and Analysis of Renewable Energy Conversion Systems 3(3+0)

UNIT I
Energy cycle of the earth; water flow and storage; ocean currents and tides. Energy heat flow and energy storage; photosynthesis and biomass; renewable energy sources.

UNIT II

Thermodynamics of energy conversion; conversion of solar energy, wind energy, water flows, heat, biomass, etc.; other conversion processes.

UNIT III
Development and use of biogas, alcohols and plant oils, plant oil esters in I.C.engines. Study of various parameters for measuring the performance of the output.

UNIT IV
Design of bio-fuel production units: design of gasifiers, gas flow rates, biogas plants. Establishment of esterification plant, fuel blending.

Suggested Readings

1) Boyle Godfrey. 1996. Renewable Energy: Power for Sustainable Future. Oxford Univ. Press.
2) Culp AW. 1991. Principles of Energy Conservation. Tata McGraw Hill. Duffle JA 3) Beckman WA. 1991. Solar Engineering of Thermal Processes. John Wiley.
4) Garg HP & Prakash J.1997. Solar Energy - Fundamental and Application. Tata McGraw Hill.
5) Grewal NS, Ahluwalia S, Singh S & Singh G. 1997. Hand Book of Biogas

Technology. Solar Energy Fundamentals and Applications. TMH New Delhi.
6) Mittal KM. 1985. Biomass Systems: Principles & Applications. New Age International.

PGS 506 DISASTER MANAGEMENT 1+0=1 (e-Course)

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches,
Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion
Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.
Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

Suggested Readings

Gupta HK. 2003. Disaster Management. Indian National Science Academy. Orient Blackswan.
Hodgkinson PE & Stewart M. 1991. Coping with Catastrophe: A Handbook of Disaster Management. Routledge.
Sharma VK. 2001. Disaster Management. National Centre for Disaster Mgt. India.

RES-507* Agricultural Waste and Byproduct Utilization 3(2+1)

UNIT I
Generation of by-products, agricultural and agro industrial byproducts/wastes, properties, on site handling, storage and processing.
Collection of wastes, utilization pattern as fuel, agricultural waste fired furnaces: Mechanism, construction and efficiency, suitability of wastes as fuel, fuel briquettes, briquetting process, equipment, factors affecting briquetting.
UNIT II
Utilization of wastes for paper production, production of particle board, utilization, by-products from rice mill, rice husk, rice bran, utilisation.
UNIT III
Thermo-chemical conversions, densification, combustion and gasification, extraction, biological conversions, anaerobic digestion, biochemical digestion process, digestion systems, energy from anaerobic digestion, cellulose degradation, fermentation process.

Practical

Exercises on stepped grate and fixed grate rice husk furnaces, waste fired furnace, briquette machine, production of alcohol from waste materials, production and testing of paperboards and particleboards from agricultural wastes.

Suggested Readings

1) ASAE Standards. 1984. Manure Production and Characteristics.
2) Bor S Luh (Ed.). 1980. Rice: Production and Utilization. AVI Publ.
3) Chahal DS. 1991. Food, Feed and Fuel from Biomass. Oxford & IBH.

4) Chakraverty A. 1989. Biotechnology and other Alternative Technologies for Utilisation of Biomass/ Agricultural Wastes. Oxford & IBH.
5) David C Wilson. 1981. Waste Management - Planning, Evaluation,Technologies.
6) Donald L Klass & Emert H George 1981. Fuels from Biomass and Wastes. Ann. Arbor. Science Publ.
7) Srivastava PK, Maheswari RC & Ohja TP. 1995. Biomass Briquetting and Utilization. Jain Bros.
8) USDA 1992. Agricultural Waste Management Field Handbook. USDA.Wilfred A Cote.1983. Biomass Utilization. Plenum Press.

RES-509 Biogas Technology and Appliances 2(1+1)

UNIT I

Biogas Technology, Introduction, historical background, chemistry of fermentation (Mechanism of extraction) Physical condition for fermentation, raw materials.

Biogas Plants : Types of designs, classification, design of a biogas plant (animal dung and organic waste), selection of model and size, construction technique, material requirement, high rate digester, night soil and kitchen waste based biogas plants.

UNIT II

Biogas distribution and utilization, properties of biogas, uses of biogas, design of gas distribution system, pressure and flow measuring devices, safety devices, biogas fittings. Biogas utilization devices, Burners and stoves, biogas lamps, biogas scrubbing & Compressing. Principle of dual fuel engines and its limitations. generation of power. Thermal efficiency and cooking efficiency test of biogas burners.

UNIT III

Effluent : Handling of effluent of biogas plant (animal dung based, night soil, kitchen waste and agro, industrial waste based) effluent treatment and management.

UNIT IV

Alternate feed material: Use of distillery and sugar mills effluent, willow dust, agro waste agro and processing industry waste for biogas production. Repair and maintenance of biogas plants.

Practical

Study of different types of biogas plant & appliances. Determination of thermal efficiency of biogas burner and lamp, diesel replacement in I.C. engine. Use of biogas spent

Suggested Reading

1. Biogas Technology. A Practical Hand Book Vol-I.KC Khandelwal and S.S. Mahdi. Tata McGraw Hill pub. Co.Ltd. New Delhi.
2. Advances in Biogas Technology, O.P. Chawala, ICAR, New Delhi.
3. Methane Generation From Human Animals and Agril Wastes, National Academy of Sciences, Washington D.C.
4. Modeling & Simulation of Biogas system Economies S.A. Abbasi & P.C. Nipaney Ashish pub. House. New Delhi 26 (1993)

RES-510 Energy, Ecology and Environment 3(3+0)

UNIT I

Environment and energy systems, various energy process related to environment origin of earth, sun as a source of energy and its radiation, classification, quality and quantity of energy sources, characteristics of temperature, energy supply and consumption. Renewable and non renewable energy sources.

UNIT II

Ecosystem, basic kinds of ecosystem, transification of ecosystem, component parts of ecosystem, ecosystem development of evaluation, Major ecosystem of the world.
Physical environment and metrology, environment.

UNIT III

Environmental degradation, thermal and chemical pollution, Primary and secondary pollutant, air pollution, water pollution unclear energy hazard, radioactive hazards mining hazards, land use, oil spills and gas leaks,

UNIT IV

climatic charges, ozone layer depletion, global warming and their control.
Cost benefit analysis, environmental cost of use of renewable and nor renewable energy sources. Method of ELA, various issue underlying EIA, and sustainable development.

Suggested Readings:

1. Essam E. EI, Hinnami, Environmental Impact of Production and use of Energy. Tycooly pres Ltd.(1991)
2. EH Thomdike, Energy & Environment. a premier for Scientists and Engineers. Adson, Wesley Pub. Co. (1978)
3. L.C. Canter Environmental Impact Assessment. McGraw Hill Pub. Co. (1979)
4. R. Wilson & W.J. Jones, Energy, Ecology & the Environment. Academic Press Inc.(1974)
5. A.N. Mathur, N.S. Rathore, & V.K. Vijay (1995), Environmental Awareness, Himanshu Pub., Udaipur.

RES 521 ENERGY MANAGEMENT IN FOOD PROCESSING INDUSTRIES 3(1+2)

Theory

UNIT I

Energy forms and units, energy perspective, norms and scenario; energy auditing, data collection and analysis for energy conservation in food processing industries.

UNIT II

Sources of energy, its audit and management in various operational units of the agro-processing units; passive heating, passive cooling, sun drying and use of solar energy, biomass energy and other non-conventional energy sources in agro-processing industries.

UNIT III

Reuse and calculation of used steam, hot water, chimney gases and Cascading of energy sources. Energy accounting methods, measurement of energy, economics of energy use.

Practical

Study of energy use pattern in various processing units i.e., rice mills, sugar mills, dal mills, oil mills, cotton-ginning units, milk plants, Agro-processing food industries etc. Energy audit study and management strategies in food processing plants. Identification of energy efficient processing machines. Measurement and assessment of overall energy consumption, production and its cost in food processing plants, visit to related food processing industry.

Suggested Books

1. Pimental D. 1980. Handbook of Energy Utilization in Agriculture. CRC Press.
2. Rai GD. 1998. Non-conventional Sources of Energy. Khanna Publ.
3. Twindal JW & Anthony D Wier 1986. Renewable Energy Sources. E & F. N. Spon Ltd.
4. Verma SR, Mittal JP & Surendra Singh. 1994. Energy Management and Conservation in Agricultural Production and Food Processing. USG Publ. & Distr., Ludhiana.

c. Bachelor Programmes

Name of the Programme: B.Tech.(Agril. Engg.)

Semester No.	Term No.	Course No.	Credits	Title of the course offered by the department
I	1st	EOES-111	2(1+1)	Engineering Chemistry
		BS-PHY-112	3(2+1)	Engineering Physics
II	2nd	EOES-122	3(2+1)	Applied Electronics and Instrumentation
III	1st	EOES-233	3(2+1)	Electrical Circuit
IV	2nd	EOES-244	3(2+1)	Electrical Machines and Power Utilization
VI	2nd	EOES-365	3(2+1)	Renewable Energy Sources
VII	1st	CAF-EOES-471	3(2+1)	Waste and By-product Utilization.
		CAF-EOES-472	3(2+1)	Renewable Energy Technologies
		CAF-EOES-473	3(2+1)	Control Engineering in Agriculture
		CAF-EOES-474	3(2+1)	Utilization of Electrical Energy in Agriculture
		CAF-EOES-475	3(2+1)	Energy Conservation and Management in Agriculture
		CAF-EOES-476	3(2+1)	Data Base Management and Micro-processor Application

Course Curricula and syllabi of each subject:

EOES 111 Engineering Chemistry	**Credits: 2(1+1)**

Theory:

Phase rule and its application to one and two component systems. Fuels: classification, calorific value. Colloids: classification, properties. Corrosion: Definition of all type of causes corrosion, types and method of prevention. Corrosion control, Water: temporary and permanent hardness, disadvantages of hard water, scale and sludge formation in boilers, boiler corrosion. Lubricants: properties, mechanism, classification and tests. Polymers. Types of polymerization, properties, uses and methods for the determination of molecular weight of polymers.

Practicals:

1) Determination of temporary and permanent hardness of water by EDTA method
2) Estimation of chloride in water
3) Estimation of dissolved oxygen in water
4) Determination of BOD in water sample

5) Determination of COD in water sample
6) Estimation of available chlorine in bleaching powder
7) Determination of viscosity of oil
8) Estimation of alkalinity of water sample
9) Determination of calorific value of solid fuel
10) Determination of calorific value of gaseous fuel

EOES -122 Applied Electronics and Instrumentation	**Credits : 3(2+1)**

Theory:

p-n junction, V-I characteristics of p-n junction, diode as a circuit element, rectifier, clipper, clamper, voltage multiplier, capacitive filter, diode circuits for OR & AND (both positive and negative logic), Transistor as an amplifier CB, CE, CC, operating point, classification(A,B & C) of amplifier, various biasing methods (fixed, self, potential divider), h-parameter model of a transistor, CE amplifier, phase shift oscillator, ideal OP-AMP characteristics, linear and non-linear applications of OP-AMP (adder, subtractor, integrator, active rectifier, comparator, differentiator, differential, instrumentation amplifier and oscillator), zener diode voltage regulator, transistor series regulator, current limiting, OP-AMP voltage regulators, Basic theorem of Boolean algebra, Combinational logic circuits (basic gates), binary ladder D/A converter, successive approximation A/D converter, generalized instrumentation, measurement of displacement, temperature, velocity, force and pressure using potentiometer, resistance thermometer, thermocouples, bourden tube, LVDT, strain gauge and tacho-generator.

Practical:

1. To study V-I characteristics of p-n junction diode;
2. To study half wave, full wave and bridge rectifier;
3. To study transistor characteristics in CE configurations;
4. To study a diode as clipper and clamper;
5. To study a OP-AMP IC 741 as inverting and noninverting amplifier;
6. To study a OP-AMP IC 741 as differentiator amplifier;
7. To study a zener regulator circuit;
8. To study a OP-AMP IC 741 as a active rectifier;
9. To study a OP-AMP IC 741 as a comparator;
10. To familiarize with various types of transducers.

EOES-233 Electrical Circuit	**Credits: 3 (2+1)**

Theory:

Average and effective value of sinusoidal and linear periodic waveforms. Independent and dependent sources, loop current and loop equations (Mesh current method), node voltage and node equations (Nodal voltage method), Network theorems: Thevenin' s, Norton's, Superposition, Reciprocity and Maximum power transfer, Star- Delta conversion solution of DC circuit by Network theorems, Sinusoidal steady state response of circuits, Instantaneous and average power, power factor, reactive and apparent power, Concept and analysis of balanced polyphase circuits, Disadvantages of low power factor and power factor improvement, various methods of single and three phase power measurement, staircase and go down wiring.

Practical:

1. To familiarize with the components and equipments used in Laboratory.

2. To verify Kirchhoff' s current laws.
3. To verify Kirchhoff' s voltage laws.
4. To verify Thevenin theorems.
5. To verify Norton' s theorems.
6. To verify Superposition theorem.
7. To verify reciprocity theorem.
8. To study the sinusoidal response of RL series circuit.
9. To study the sinusoidal response of RC series circuit.
10. To study power consumed in a three-phase circuit.

EOES-244 Electrical Machines and Power Utilization	**Credits : 3 (2+1)**

Theory:

Electro motive force, reluctance, laws of magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, hysteresis and eddy current losses, Transformer: principle of working, construction of single phase transformer, EMF equation, transformer on load, voltage regulation, power and energy efficiency, open circuit and short circuit tests, principles, operation and performance of DC machine (generator and motor), EMF and torque equations, armature reaction, commutation, excitation of DC generator and their characteristics, DC motor characteristics, starting of shunt and series motor, starters, speed control methods-field and armature control, polyphase induction motor: construction, operation, effect of rotor resistance, torque equation, starting and speed control methods, single phase induction motor: double field revolving theory, characteristics, phase split, shaded pole motors

Practical:

1. To get familiar with AC, DC machines and measuring instruments;
2. To perform open circuit and short circuit tests on a single phase transformer and hence find voltage regulation and efficiency;
3. To study the constructional details of D.C. machine and to draw sketches of different components;
4. To obtain load characteristics of d.c. shunt/series /compound generator;
5. To study characteristics of DC shunt/ series motors;
6. To study d.c. motor starters;
7. To Perform load-test on 3 ph. induction motor & to plot torque V/S speed characteristics;
8. To perform noload & blocked rotor tests on 3 ph. Induction motor to obtain ckt. parameters & to draw circle diagram;
9. To study the speed control of 3 ph. induction motor by cascading of two induction motors, i.e. by feeding the slip power of one motor into the other motor;
10. To study star delta starters physically and (a) to draw electrical connection diagram (b) to start the 3 ph. induction motor using it. (c) to reverse the direction of 3 ph. I.M.;

11. To start a 3-phase slip –ring induction motor by inserting different levels of resistance in the rotor ckt. and to plot torque –speed characteristics;
12. To perform no load & blocked –rotor test on 1 ph. induction motor & to determine the parameters of ckt. drawn on the basis of double revolving field theory;
13. To perform load test on 1 ph. induction motor & plot torque –speed characteristics.

EOES 365 Renewable Energy Sources	**Credits : 3 (2+1)**

Theory:

Classification of energy sources; Introduction to renewable energy sources; characterization of biomass; types, construction, working principle, uses and safety/environmental aspects of different renewable energy devices like gasifiers, biogas plants, solar passive heating devices, photovoltaic cells and arrays; Brief introduction to wind energy, hydroelectric energy, ocean energy, briquetting and baling of biomass, biomass combustion, biodiesel preparation and energy conservation in agriculture.

Practicals:

1. Preparation of biomass sample
2. Determination of calorific value;
3. Determination of proximate analysis
4. Demonstration of down draft throatless rice husk gasifier;
5. Demonstration of down draft gasifier with throat;
6. Demonstration of rice husk gasifier for thermal use;
7. Demonstration of working of a fixed dome type biogas plants;
8. Demonstrations of working of a floating drum type biogas plants;
9. Demonstration of biodiesel preparation;
10. Measurement of basic solar parameters;
11. Demonstration of solar water heater;
12. Demonstration of PVC;
13. Demonstration of solar cooker;
14. Determination of fuel properties.

Cafeteria courses of Electrical and Other Energy Sources

CAF-EOES -471 Waste and By-Product Utilization	**Credits : 3(2+1)**

Theory:

Types and formation of byproducts and waste; magnitude of waste generation in different food processing industries; concept scope and maintenance of waste management and effluent treatment, Temperature, pH, Oxygen demands (BOD, COD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues, Waste utilization in various industries, furnaces and boilers run on agricultural wastes and byproducts, briquetting of biomass as fuel, production of charcoal briquette, generation of electricity using surplus biomass, producer gas generation and

utilization, waste treatment and disposal, design, construction, operation and management of institutional community and family size biogas plants, concept of vermi-composting, Pre-treatment of waste: sedimentation, coagulation, flocculation and floatation, Secondary treatments: Biological and chemical oxygen demand for different food plant waste– trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons, Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters, phosphorous, sulphur, nitrogen and heavy metals removal, Assessment, treatment and disposal of solid waste; and biogas generation.

Practical:

1. Waste characterization: (a) temperature (b) pH (c) solids content (d) turbidity (e) BOD (f) COD.
2. Determination of ash content of agril. Wastes.
3. Determination of unburnt carbon in ash of paddy straw.
4. To study about briquetting of agricultural residues.
5. Estimation of excess air for better combustion of briquettes.
6. To study about extraction of oil from rice bran.
7. To study about waste treatment plant in food industry.
8. To study about utilization of whey.
9. To study about recovery of peel oil.
10. To study about recovery of germ and germ oil from by-product of cereals.
11. Practical on bioconversion of agro-wastes.
12. Practical on recycling of agro-wastes and by-products.
13. Visits to various industries using waste and food byproducts.

CAF-EOES -472 Renewable Energy Technologies	**Credits : 3 (2+1)**

Theory:

Design and operational parameters, performance evaluation and maintenance aspects of different renewable technologies like gasifiers, biogas plants, solar passive heating devices, photovoltaic cells and arrays, briquetting machines and balers; bio-diesel utilization in CI engines.

Practical:

1. Performance evaluation of solar water heater;
2. Performance evaluation of solar cooker;
3. Characteristics of solar photovoltaic panel;
4. Evaluation of solar air heater/dryer;
5. Performance evaluation of a rice husk throatless gasifier engine system;
6. Performance evaluation of down draft gasifier with throat for thermal application;
7. Performance evaluation of a fixed dome type biogas plant;
8. Performance evaluation of floating drums type biogas plant;
9. Estimation of calorific value of producer gas;
10. Testing of diesel engine operation using biodiesel;
11. Evaluation of briquetting machine using biomass material;
12. Evaluation of rice straw briquette.

CAF-EOES -473 Control Engineering in Agriculture	**Credits : 3 (2+1)**

Theory:

Introduction to control system, feedback and feed-forward control systems, block diagrams, Laplace and inverse Laplace transforms, mathematical models of physical systems, structured modeling (Bond Graph modeling), transfer function, steady state analysis, state variable characterization dynamics of first and second order systems, electronic paramatic and hydraulic control system and their appliances to farm machinery, food process industry, aquaculture and milk processing plants.

Mode of control and generations of control actions, P, PI and PHD controllers, final control elements and valve positioners, frequency response and root locus analysis, Nyquist stability criterion, stability and quality of overall control system, digital control.

Electronic, pneumatic and hydraulic control systems, and their applications to farm machinery, food processing industry, aquaculture and milk processing plants.

LIST OF PRACTICSL:

1. Study of generalized control systems.
2. Static calibration of flapper nozzle assembly.
3. Calibration of pneumatic P,PI and PID controllers
4. Study and calibration of control valves.
5. Cascade control of flow and level/flow and temperature.
6. Visits to different plants for instrumentation and controls.
7. Study of hydraulic, mechanical/electronic controllers.

CAF-EOES -474 Utilization of electrical energy in agriculture	**Credits : 3 (2+1)**

Theory

Motor characteristics, standards, ratings and selection of motors, Duty cycles and efficiency. Electrical heating, Welding charging of batteries. Cost of electricity energy audit, effect of power factors, renewable electrical energy devices. Special electrical appliances and controls use for dairy, poultry, processing and irrigation system.

LIST OF PRACTICALS:

1 Selection of electrical motors for different farm operations.
2 Study of electrical lighting, heating and welding systems.
3 Study and survey of electrical equipments used in dairy, poultry and livestock farming.
4 Tracing of faults in electrical wiring and winding.
5 Servicing and repairing of fans, blowers and FHP motors.
6 Design and preparing layout of farm electrical distribution system.
7 Study of electrical energy auditing Tarrif and conservation of electrical energy on farm.
8 Study of renewable electrical energy system.
9 Study of Charging of Batteries.
10 Study of PF improver & controls (single phasing earthing.)
11 Electrical energy use in Processing and Irrigation.\

CAF-EOES -475 Energy Conservation and Management in Agriculture	**Credits : 3 (2+1)**

Theory:

Classification of energy on the basis of sources, Agricultural energy inputs and their energy values, Energy audit, selection of villages & classification of agricultural farms, classification of data availability on power and energy requirements for various filed operations, operational cost from various power sources for different agro climatic zones crop grown energy analysis in crop production in various farming systems for rabbi, kharif and summer crops, comparison on energy utilization pattern for major crop production, Energy requirement in different agro based industries, energy conversion systems, energy systems in Green houses and passive architecture, energy environment and economics consideration, New sources of energy.

LIST OF PRACTICALS:

1. To study Agricultural Energy sources input categorization and energy equivalent.
2. To study accounting energy in Farm Machinery and welding.
3. To study energy required for irrigation.

4. To study energy inputs in crop production.
5. To study Agriculture energy relationship.
6. To study the energy requirements for different agro processing operations.
7. To study the energy conserving methods (Appropriate Technology).
8. Field visits on farm & industries on energy utilization aspects.
9. Minor project on energy analysis for crop productions processed products.

CAF-EOES -476 Data Base Management and Mirco-processor Application	Credits :3 (2+1)

Theory:

Data structures, records and files, fixed and available length records, sorting, merging, searching and hushing techniques. Differ and buffer management. Bulk storage devices and file management systems, sequential and direct success devices, indexing, data manipulation language, data security, introduction to microprocessor, architecture of 8,16 and 32 bit microprocessors, assembly language of 8085, Micro controllers; data converters. Application of microprocessors to process control and instrumentation.

LIST OF PRACTICSL:

1. Introduction of dBase 3+(data structure, field records, files).
2. To create a data base file using dBase 3+
3. Sorting and indexing records.
4. Merge the data base files.
5. Study of the Differ and Buffer management
6. Study of the file management system
7. Study the bulk/sequential and direct access devices.
8. Introduction to 8085 micro processor (8.16 and 32).
9. Assembly language programme I
10. Assembly language programme II
11. Study of data lowers single channel, multi channel.
12. Data equation and multi plexing.
13. Study the application of micro processors to processor control and instrumentation viz. Temperature, flow, torque, speed RH etc.

4. Infrastructure

a. Laboratories

1. Renewable Energy Laboratory, Department of Electrical and Other Energy Sources, CAET, Dapoli
2. Electrical Laboratory, Department of Electrical and Other Energy Sources, CAET, Dapoli
3. Physics Laboratory, Department of Electrical and Other Energy Sources, CAET, Dapoli

b. Name of important instrument/facilities:

Gas analyzer, UV Photo spectrometer, Bomb calorimeter, Redwood viscometer, Flash & Fire point apparatus, Junkers Gas Calorimeter, Solarimeter, Lux meter, Solar Dryers, Solar Water heater, Briquetting Machine, Solar Distillation Unit, solar cookers, Sheffller Cooker, Gasifire, Solar Tunnel Dryers, improved Chulha, Cookstove, Handheld infrared thermometer, cup type anemometer, Electrical Oven, Mufful Furness, , Electrical measuring kit, Peezometer, B.O.D & C.O.D apparatus, Load Bank etc

c. Activities: Teaching and practical to the student.

d. Photographs:

Tachometer

BOD Analyzer

Gas Analyzer | **Spectro Photometer**

	
Muffle Furnace	**Oven**
	
Gas Analyzer	**BOD Analyzer**
	

	
	Biodiesel Processor
	
Lux meter	

5. Faculty

a. Academic staff: Assistant professor and above with the details of the staff as given below

Recent Photograph	**Name of the Faculty**	Dr. Y P Khandetod
	**Post Held**	Professor & Head
	Date of Birth	05 August 1961
	Qualification	B.Tech (Agril. Engg.)-Dr.PDKV, Akola M.Tech (Post Harvest Engg.) –IIT Kharagpur Ph.D (Agril. Food Engg.)-IIT Kharagpur
	Aria of Specialization	Renewable Energy
	Experience (Years)	27 Year
	Research Project	

	Guided **Ph.D** **M.Sc./M.Tech** **B.Tech.**	 01 (02 In Progress) 04 (02 In Progress) 19
	Present area of Research	Renewable Energy
	Contact details **Land line No.** **Mobile No.** **Fax No.** **Email**	 **(02358) 282414** **09420156693** **(02358) 282414** **ypkhandetod@rediffmail.com**
Recent Photograph	**Name of the Faculty**	Dr. A. G. Mohod
	**Post Held**	Associate Professor
	Date of Birth	31August 1972
	Qualification	B.Tech (Agril. Engg.)- Dr.PDKV, Akola M.Tech (Energy)- SEES, DAVV, Indore (M.P) Ph.D (Renewable Energy Engg.)- MPUAT, Udaipur
	Aria of Specialization	Renewable Energy
	Experience (Years)	**13 Year**
	Research Project **Guided** **Ph.D** **M.Sc./M.Tech** **B.Tech.**	 **Nil** **07** **20**
	Present area of Research	Renewable Energy
	Contact details **Land line No.** **Mobile No.** **Fax No.** **Email**	 **02358-282414** **9423874260** **02358-282414** **agmohod@rediffmail.com**
Recent Photograph	**Name of the Faculty**	Mrs. S. V. Aware

	Post Held	Assistant Professor
	Date of Birth	05 May 1975
	Qualification	B.Sc. (Physics)- Pune University M.Sc. (Electronics)- Pune University
	Aria of Specialization	**Physics and Electronics**
	Experience (Years)	**14.5 Year**
	Research Project Guided **Ph.D** **M.Sc./M.Tech** **B.Tech.**	 Nil Nil Co-guided 07
	Present area of Research	
	Contact details **Land line No.** **Mobile No.** **Fax No.** **Email**	 9421232335 Seemaaware21@gmail.com
Recent Photograph	**Name of the Faculty**	Er. R. M. Dharaskar
	**Post Held**	Assistant Professor
	Date of Birth	01 January 1972
	Qualification	B.E. (Electrical)- Amravati University M.E. (Electrical power system)- Amravati University
	Aria of Specialization	Electrical Power System
	Experience (Years)	13 year
	Research Project Guided **Ph.D** **M.Sc./M.Tech** **B.Tech.**	 02
	Present area	Electrical Power System

	of Research	
	Contact details **Land line No.** **Mobile No.** **Fax No.** **Email**	 02358-282414 09423295769 02358-282414 rdharaskar@yahoo.com

b. Research staff: The name of the research staff member like SRA and JRA.

Recent Photograph	**Name of the Faculty**	Er. H. Y. Shrirame
	**Post Held**	Senior Research Assistant
	Date of Birth	07 February 1982
	Qualification	B.Tech (Agril. Engg.)_Dr.PDKV, Akola M.E (Renewable Energy Engg.)- MPUAT, Udaipur
	Aria of Specialization	Renewable Energy
	Experience (Years)	6 Year
	Research Project Guided **Ph.D** **M.Sc./M.Tech** **B.Tech.**	Nil
	Present area of Research	Renewable Energy
	Contact details **Land line No.** **Mobile No.** **Fax No.** **Email**	 02358-282414 9422545915 02358-282414 hemantshrirame@gmail.com

6. Infrastructure Farm

a. Location: Dr. BALASAHEB SAWANT KONKAN KRISHI VIDYAPEETH, Campus, Dapoli, Dist.: Ratnagiri

b. Infrastructure: Energy Park, Department of Electrical and Other Energy sources, CAET, Dapoli.

c. Activities: Teaching and demonstration of different Renewable Energy Devices to farmers, students, small self help groups etc.

d. Photographs:

"Energy Park", Department of Electrical and Other Energy Sources, C.A.E.T, Dapoli

Demonstration of distillation plant to the students at "Energy Park", Department of Electrical and Other Energy Sources, C.A.E.T, Dapoli

Demonstration of Solar tunnel dryer to the students at “Energy Park”,
Department of Electrical and Other Energy Sources, C.A.E.T, Dapoli

Demonstration of Solar Grass cutter to the students at “Energy Park”,
Department of Electrical and Other Energy Sources, C.A.E.T, Dapoli

7. Research activities and Achievements(Including Projects)

a. Variety/Implements released: Nil

b. Research Recommendation:

Sr. No.	Recommendation Year	Recommendation Title	Scientist Name
1.	2004	Low cost rice husk stove for cooking.	A.G.Mohod, Associate Pofessor Dr. V.T.Badhe Associate Dean (Ex)
2.	2007	The light weight low cost suitcase type solar box cooker "Rasai" (KKV SC2GC) is recommended for cooking of food in the remote area.	Dr. A.G.Mohod Associate Professor Dr. A.G.Powar Associate Dean
3.	2007	Solar photo voltaic powered grass cutter is suitable for cutting the wet grass and grass lawn.	A.G.Mohod Associate Professor A.G.Powar Associate Dean
4.	2009	The technology developed by Dr. B.S.K.V., Dapoli for the production of biodiesel from Undi oil with 15 lit. processor is recommended.	Dr. Y.P.Khandetod, Professor A. G. Mohod, Associate Professor Dr. S. H. Sengar, Asstt. Professor
5.	2010	Development and evaluation of concentrating solar reflector CNSL (Cashew-nut shell liquid) extractor .	Dr. Y.P.Khandetod, Professor Dr. A. G. Mohod, Associate Professor Dr. S. H. Sengar, Asstt. Professor
6.	2010	Design, development and evaluation of solar tunnel dryer for fish drying.	Dr. A. G. Mohod, Associate Professor Dr. S. H. Sengar, Asstt. Professor Dr. Y.P.Khandetod, Professor R.M. Dharaskar Asstt. Professor
7.	2011	The distillation of ethanol production (up to 35 % concentration) from fermented cashew apple juice using Parabolic concentrating solar cooker (SK-14) is recommended.	Dr. Y.P.Khandetod, Professor Dr. A. G. Mohod, Associate Professor Dr. S. H. Sengar, Asstt. Professor
8.	2012	Carbonized cashew nut shell, grass and rice husk powdered in proportion of 50:25:25 with addition of 5 % Karanj oil is recommended for briquette preparation of 2.25 cm diameter.	Dr. S. H. Sengar, Asstt. Professor Dr. Y.P.Khandetod, Professor Dr. A. G. Mohod, Associate Professor
9	2013	Dr. B.S.K.K.V. developed W-shape three channels solar still erected on ground using 200 micron UV stabilized clear poly ethylene film is recommended for production of 2 lit/day distilled water in Konkan region.	Dr. S. H. Sengar, Asstt. Professor Dr. Y.P.Khandetod, Professor Dr. A. G. Mohod, Associate Professor
10	2013	DBSKKV designed and developed Open top gasifier cum stove is recommended for cooking application for saving the wood fuel and cooking time over biomass based traditional cooking system.	Dr. A. G. Mohod, Associate Professor Dr. Y.P.Khandetod, Professor Dr. S. H. Sengar, Asstt. Professor

11	2015	DBSKKV developed portable folding type solar dryer is recommended for drying of agricultural products.	Dr.Y.P.Khandetod, Professor & Head Dr. A. G. Mohod, Associate Professor Er. H. Y. Shrirame, Sr. Res. Asstt.
12	2015	DBSKKV developed drying unit is recomDBSKKV developed drying unit is recommended as a attachment for commercially available biomass fired water heating system.	Dr. A. G. Mohod, Associate Professor Dr.Y.P.Khandetod, Professor & Head Er. H. Y. Shrirame, Sr. Res. Asstt

c. Research Outcome/Finding:

1. Design and Development of Rice Husk Stove.(2003)
2. Design and Development of Solar Grass Cutter.(2006)
3. Design and Development of Solar operated pumping system and Battery Charging Unit.(2007)
4. Design and Development of Low cost light weight solar suitcase type cooker.(2007)
5. Development of biodiesel processor for production of Undi biodiesel.(2009)
6. Studies on utilization of solar energy for cashew nut steaming.(2009)
7. Study on production of ethanol from cashew apple by using solar energy.(2011)

d. Completed Research Project/Programmes/Schemes:

Title:	Design and Development of Solar Tunnel Dryer for Fish
UR Nos.:	
Objectives:	1.Development of Solar Tunnel Fish Dryer 5 Kg/ 10 Kg (100 Kg/Batch) 2.Utilization of Solar Energy for Fish Drying with minimum time 3.Use of Solar Tunnel Dryer for Drying of other Products
Name of PI/Co-PI	
Sponsoring Agency:	Indian Council of Agriculture Research, New Delhi
Duration:	2005-2007
Total Outlay:	
Summary of Achievements:	1.Development of Solar Tunnel Fish Dryer 5 Kg/ 10 Kg (100 Kg/Batch). 2.Utilization of Solar Energy for Fish Drying with minimum time World, Bank, New Delhi. 3.Use of Solar Tunnel Dryer for Drying of other Products.

Relevant Photograph:	

Title:	Development of Energy Park
UR Nos.:	
Objectives:	1. First Energy Park in Konkan 2. 70 Renewable Devices Kept in One place 3. 40,000 visitors visited at Energy Park Since 2005
Name of PI/Co-PI	
Sponsoring Agency:	Ministry of New and Renewable Energy, New Delhi
Duration:	2004-2005
Total Outlay:	
Summary of Achievements:	1. First Energy Park in Konkan 2. 70 Renewable Devices Kept in One place. 3. 80,000 visitors visited at Energy Park Since 2005.
Relevant Photograph:	

Title:	Use of Solar Cooker (SK-14) for CNSL Extraction and Cooking
UR Nos.:	
Objectives:	1.Use of solar Energy for cooking as well as extraction cashew nut shell oil

	2.Pollution free technology 3.Distributed of SK-14 type concentrating solar cooker to self help group of Cashew processing.
Name of PI/Co-PI	Dr. A.G. Mohod Dr. Y.P. Khandetod Dr. S. H. Sengar
Sponsoring Agency:	World, Bank, New Delhi
Duration:	2007-2009
Total Outlay:	
Summary of Achievements:	1.Use of solar Energy for cooking as well as extraction cashew nut shell oil 2.Pollution free technology 3.Distributed of SK-14 type concentrating solar cooker to self help group of Cashew processing.
Relevant Photograph:	

e. Ongoing Research Projects/Programmes/Schemes:

Sr. No.	Project Title	Name Of PI	Year Of Start
1	University Project "Design and development of parabolic folding type solar dryer".	Dr. Y.P. Khandetod Dr. A.G. Mohod Er. H.Y. Shrirame	2012-2013
2	University Project "Design, development and evaluation of biomass based composite unit for water heating and drying".	Dr. A.G. Mohod Dr. Y.P. Khandetod Er. H.Y. Shrirame	2012-2013

8. Repository of abstracts of the theses:

B.Tech.(Agril. Engg.)

Sr. No.	Name of Candidate:	Degree for which the thesis/project report submitted:	Year of submission:	Name of the Guide/CO-guide:	Abstract
1	Mr. Pawar K.A Miss Jadhav S.G	B.Tech. (Agril. Engg.)	2002-2003	Dr. A.G Mohod	Design development &

					evaluation of Solar PV Powered grass cutter.
2	Mr. Jagtap V. P Mr. Patil V.V Mr. Patil K.D	B.Tech. (Agril. Engg.)	2003-2004	Dr. A.G Mohod	Comparative performance evaluation of solar drying for fish drying.
3	Miss. Samant S. A	B.Tech. (Agril. Engg.)	2003-2004	Dr. A.G Mohod	Characterization of Biomass fuel for energy in Kokan region
4	Mr. Kamble B. D Mr. Hagawan P. J	B.Tech. (Agril. Engg.)	2003-2004	Dr. A.G Mohod	Performance evaluation of thermal gasifier for community cooking.
5	Mr. Kadam S. A Bamane R. A	B.Tech. (Agril. Engg.)	2004-2005	Dr. A.G Mohod	Design development & evaluation of solar drying for fish drying.
6	Miss. Jadhav S. L Mr. Patil P. R	B.Tech. (Agril. Engg.)	2005-2006	Dr. A.G Mohod	Performance evaluation of solar fish dryer.
7	Mr. Ghorpade S. S Mr. Moule A. P	B.Tech. (Agril. Engg.)	2005-2006	Dr. A.G Mohod	Performance evaluation of briquetting machine.
8	Mr. Joshi A. V Mr. Rosal V. V	B.Tech. (Agril. Engg.)	2006-2007	Dr. A.G Mohod	Development & evaluation of low cost light weight solar cooker.
9	Miss. Deshmukh R. S Miss. Patil P. A	B.Tech. (Agril. Engg.)	2006-2007	Dr. Y. P Khandetod	Performance evaluation of concentrating Scheffler solar cooker for domestic application.
10	Mr. Walwalkar G. J Mr. Durgawale S.S	B.Tech. (Agril. Engg.)	2007-2008	Dr. Y. P Khandetod	Utilization of solar energy for cashew nut steaming.
11	Mr. Rahatwal S. D Mr. Satawase K. S	B.Tech. (Agril. Engg.)	2007-2008	Dr. Y. P Khandetod	Performance evaluation of different methods of cashew nut shell liquid (CNSL)

					extraction .
12	Mr. Modak S. P Mr. Gupta D. K	B.Tech. (Agril. Engg.)	2008-2009	Dr. S. H Sengar	Design and Development of single basin wick type Solar Desalination plant.
13	Mr. Karandikar K. V Mr. Aware A. G	B.Tech. (Agril. Engg.)	2008-2009	Dr. Y. P Khandetod	Performance Evaluation of Solar Tunnel Dryer for Drying of Potato Chips.
14	Miss. Parab Miss. Raut	B.Tech. (Agril. Engg.)	2009-2010	Dr. Y. P Khandetod	Design and development of folding type solar dryer.
15	Miss. Patil S. S Miss. Chandke A. D	B.Tech. (Agril. Engg.)	2009-2010	Dr. S. H Sengar	Characterization of biomass fuel in briquetted form.
16	Miss. Jadhav T. V	B.Tech. (Agril. Engg.)	2010-2011	Dr. A.G Mohod	Energy Study of Cashew Nut Steaming Boiler.
17	Ms. Mokal P.G	B.Tech. (Agril. Engg.)	2010-2011	Dr. Y. P Khandetod	Performance Evaluation Of Biomass Cook Stoves.
18	Mr. Kare B.K	B.Tech. (Agril. Engg.)	2010-2011	Dr. Y. P Khandetod	Study of fuel Characteristics of Cashew Nut Shell.
19	Mr. Patil P. E	B.Tech. (Agril. Engg.)	2010-2011	Dr. S. H Sengar	Development & Performance Evaluation of Low Cost Solar Desalination Unit.
20	Mr. Deshmukh A. D	B.Tech. (Agril. Engg.)	2010-2011	Dr. S. H Sengar	Study of Carbonization Process of Cashew Nut Shell.
21	Mr. Arote H.K.	B.Tech. (Agril. Engg.)	2011-2012	Dr. Y. P khandetod	Charecterisation of locally available biomass
22	Ms. Zagade Bharati Ramesh	B.Tech. (Agril. Engg.)	2011-2012	Dr. A. G. Mohod	Performance evaluation of open top gasifier for thermal

					application
23	Ms. Bhosale K. A.	B.Tech. (Agril. Engg.)	2011-2012	Prof. R. M. Dharaskar	Performance test of generator sets
24	Ms. Sawant Nishigandha Govind	B.Tech. (Agril. Engg.)	2011-2012	Dr. S. H Sengar	Briquetting of locally available biomass material
25	Mr. Ambekar Rohit Krishna	B.Tech. (Agril. Engg.)	2011-2012	Dr. S. H Sengar	Study of carbonization process for locally available biomass
26	Mr. Abhimanyu Kumar	B.Tech. (Agril. Engg.)	2012-2013	Dr. Y. P khandetod	Study on fuel characteristics of briquetted fuel
27	Mr. Ashutosh Anand	B.Tech. (Agril. Engg.)	2012-2013	Dr. Y. P khandetod	Design and development of portable and folding type of solar dryer for drying of potato chips
28	Mr. Barve J. S.	B.Tech. (Agril. Engg.)	2012-2013	Dr. S. H Sengar	Comparative energy analysis of solar stills
29	Mr. Hasabnis Balkrushna Dinesh	B.Tech. (Agril. Engg.)	2012-2013	Dr. S. H Sengar	Comparative performance evaluation of cook stoves
30	Mr. More Aniket Satish	B.Tech. (Agril. Engg.)	2012-2013	Dr. A. G. Mohod	Field testing of open top gasifier for cooking
31	Mr. Adarsh Dasharath Ahir	B.Tech. (Agril. Engg.)	2013-2014	Prof. Dr. Y.P. Khandetod	Study on coil type biomass based continuous flow water heater
32	Mr. Anshuman Sharma	B.Tech. (Agril. Engg.)	2013-2014	Dr. A. G. Mohod	Performance evaluation of biomass based water heater cum dryer on forced circulation mode

33	Mr. Tiwari, A. A	B.Tech. (Agril. Engg.)	2013-2014	Dr. A. G. Mohod	Performance evaluation of open top gasifier on forced circulation mode
34	Mr. Gawand M. H	B.Tech. (Agril. Engg.)	2013-2014	Er. R. M. Dharaskar	Comparative Study of Different Types of Diesel Generator Set
35	Ms.Vichare S. S	B.Tech. (Agril. Engg.)	2013-2014	Prof. Dr. Y.P. Khandetod	Production of biofuels from grass
36	Miss.Bahirat Sneha Dilip & Miss.Patil Juhi Gurunath	B.Tech. (Agril. Engg.)	2014-2015	Dr. Y.P. Khandetod	Design and development of portable and foldable type of solar dryer.
37	Ms. Patil Snehal Suresh and Ms. Bhambure Tejashri Vijay	B.Tech. (Agril. Engg.)	2014-2015	Dr. Y.P. Khandetod	Development of low cost solar water heater.
38	Ms. Kavita Bhalerao and Mr. Pranit Gaikar	B.Tech. (Agril. Engg.)	2014-2015	Dr. A. G. Mohod	Performance study of flue gas based dryer.
39	Mr. Prashant Prakash Kore and Mr. Parth Rajendrasing Pawar	B.Tech. (Agril. Engg.)	2014-2015	Dr. A. G. Mohod	Studies on carbonization and liquification of biomass.
40	Mr. Kushal Rajesh Samel and Ms. Puja Gulab Pachbhai	B.Tech. (Agril. Engg.)	2014-2015	Mrs. S. V. Aware	Development and testing of pico hydroelectric power generation unit.
41	Ms. Patil Ankita Anil and Mr. Akash Dubey	B.Tech. (Agril. Engg.)	2015-2016	Dr. Y.P. Khandetod	Study on densification of locally availble biomass
42	Mr. Avinash and Ms. Devekar Pavitra Damodar	B.Tech. (Agril. Engg.)	2015-2016	Dr. Y.P. Khandetod	Study on pyramid type of solar dryer
43	Mr. Mahesh Kailas Gadakh and Mr. Shrikant Kundalik Khandekar	B.Tech. (Agril. Engg.)	2015-2016	Dr. A. G. Mohod	Studies on carbonization and liquifacation of biomass

44	Ms. Dhage S. A. and Gavit S.N	B.Tech. (Agril. Engg.)	2015-2016	Dr. A. G. Mohod	Field Evaluation of Solar Photovoltaic Operated Weedicide Sprayer
45	Mr. Akshay D. Jadhav and Ms. Sujata V. Raut	B.Tech. (Agril. Engg.)	2015-2016	Mrs. S. V. Aware	Development and evaluation of pico hydroelectric power generation unit

M.Tech.(Renewable Energy)

Sr. No.	Name of Candidate	Degree for which the thesis/project report submitted	Year of submission	Name of the Guide/CO-guide	Abstract
1	Mr. Tambe S. J	M.Tech. (Renewable Energy)	2004-2005	Dr. A.G Mohod	Design, development and evaluation of Scheffler concentrating cooker for steam generation. Abstract: No one can deny the fact that energy is an essential pre-requisite for economic and social development, and also acts an index for assessment of a country's development. With the increase in population, industrialization, and urbanization and over exploitation of fossil fuel resources, the world as a whole is facing severe energy crises and ill effects of ecological imbalance. The solar energy can be effectively utilized for cooking application by using box type solar cooker, concentrating parabolic cooker and reflecting concentrator for community cooking. The major disadvantage of solar cooker about non-performance during the off period can be eliminated by providing the intermediate heat storage system.The problem is even more critical for developing countries like India, which

					have limited fossil fuel resources and have to rely on fuel imports. Cooking is the major shareholder in consumption of fuel and energy in domestic sector in India. It accounts about 64 % and 92 % of the total household energy demands in urban and rural areas respectively. Primary energy use is biomass, of which wood accounts about 56 %, crop residues about 16% and dung cakes about 21% (Parikh et al., 2001). These ways of cooking being not very efficient, results in wastage of valuable fuel and felling of trees is a threat to environment. The main objective of the study was to Design and development of steam generation system for cooking using Scheffler concentrator. A solar steam generation system using Scheffler concentrator was design and developed for 15 persons daily meal cooking based on the environmental parameters, cooking energy required and geometry of Sheffler type concentrating cooker. The steam generation system based on energy requirement, heat available and environment data was designed and developed. The Scheffler type reflector was designed by using the mathematical expressions and location specific solar geometry. The reflector was procured and installed at the site with direct heating system. The direct heating system and steam generation system was evaluated using different evaluation methods. The overall thermal efficiency of direct heating system was carried out by conducting water boiling test with other methods e.g. constant heat output method, constant time method and constant temperature rise method. The variation in solar energy availability, heat generated in terms of water steam quantity and steam

					pressure were noted on hourly basis using various equipments. The cooking test using rice was carried out to quantity, the time requirement for cooking. A study on solar steam generation system and direct heating system was studied using Scheffler type concentrating reflector for cooking. The average thermal efficiency of direct heating system was calculated in terms of Constant Heat Output Method (14.18 %), Constant Temperature Rise Method (14.13 %), Constant Time Method (14.35 %) and Overall Thermal Efficiency (15.78 %). It is observed that the average solar insolation is found to be 608.18 Kcal/m^2 hr attaining its peak value around 1:00 pm of the day. During evaluation of steam generation system it is observed that the heat absorbed by water from 8:00 am to 12:00 pm is mainly in the form of sensible heat to increase temperature of water The generation of steam starts at 12:35 pm and corresponding increase in steam pressure followed by steam generation. The maximum steam generation was observed at 3:35 pm 12.6 kg with maximum steam pressure at 2.4 Kg/cm^2. It is observed that at 6:00 pm about 11 kg of steam with 1.8 Kg/cm^2 retained inside the tank which revealed that the heat available inside the tank in the form of steam is about 7500 Kcal with 1.8-kg/cm^2 pressure, which may be useful for cooking of meals of about 15 persons after sunset. It is observed that, the average overall thermal efficiency of steam generation system was about 39.51 percent with average solar insolation of 610.89 Kcal/m^2h. The thermal efficiency of steam generation system was found higher as compared to direct heating system. The additional steam generation in combination with direct

					heating system facilitate the cooking of food after sunset. It will help for cooking of food of about 15 persons by using the steam after sunset. It is observed that, for cooking of 500 gm rice with 300 gm water required average 11 minutes with 2.1Kg/cm^2 steam pressure. The faster cooking of rice indicates the suitability of steam storage system for community cooking using Scheffler type reflector. The combination of direct heating system and steam facilitate the cooking of food even after the sunset using the solar energy.
2	Ms. Manjarekar R. G	M.Tech. (Renewable Energy)	2004-2005	Dr. A.G Mohod	Performance evaluation of solar tunnel dryer for fish drying.
3	Ms. Kadam K. N	M.Tech. (Renewable Energy)	2005-2006	Dr. A.G Mohod	Studies on characterization of undi for biodiesel production. Abstract: A project work was undertaken for "STUDY OF BIOFUEL CHARACTERISTICS OF UNDI (CALOPHYLLUM INOPHYLLUM L.) OIL." The methyl ester was prepared from Undi (Calophyllum Inophyllum L.) oil by using base 37avouring transesterification process. Different properties of raw undi (Calophyllum Inophyllum L.) oil and its methyl ester were determined by using the standard procedures. The specific gravity and kinematic viscosity Gross calorific value, Flash point, Fire point, Acid value, Free fatty acid content and Saponification value for Undi methyl ester were 0.856, 3.58 cS, 39.21 MJ/Kg, 188 0C, 231 0C, 0.523 mg KOH/g, 0.66 %, 200.7 respectively. In order to prepare the undi methyl ester a small-scale biodiesel processor having capacity 15 liters per batch was fabricated. In newly developed biodiesel processor recovered 85% methyl ester and 15 % 37avouring. For methyl ester preparation in small-scale

					biodiesel processor average energy consumption and total time required were 0.602 kWh and 15 hrs 10 min respectively. Average energy consumption per liter of biodiesel was 0.0501 kWh/lit. Different blends of Undi methyl ester and Karanja methyl ester were made on volume basis. Blends B0, B20 and B40 were tested for no load, 50 per cent load and 80 per cent load. The locally available Undi (Calophyllum Inophyllum L.) was found as a good source of biodiesel for engine. Methyl ester produced in small- scale biodiesel processor was clean and safe for diesel engine operation and Undi methyl ester of 40 % blend with diesel gave the best performance on diesel engine on 80 % load.
4	Ms. Bhor P. P	M.Tech. (Renewable Energy)	2005-2006	Dr. Y. P Khandetod	Performance Study of Solar Dryer for Fish Drying. Abstract: Fish is an important food item for mankind in view of its high protein content, vitamins and polyunsaturated fatty acids. Man realizes its importance from the very inception of the evaluation of the human race. It has been sole diet for many inland nations before the evaluation of farming techniques. Fish is cold-blooded, limbless, completely aquatic vertebrates having gills, commonly fins and typically elongated torpedo-shell body mostly covered with scale. The current (2004-2005) annual fish production has been Total 6.30 million tonnes from which 2.78 million tonne from the marine sector and 3.52 million tonne from the inland sector (Annual Report 2005-06, Ministry of Food Processing Industries). The marine fish production in India during the year 2000 was estimated at 2.7 million tonnes registering a 10.3% increase over the previous year. The Konkan region of

					Maharashtra is long narrow strip between 15 0 37' and 20 0 20' N latitude and 72 0 7' E and 74 0 30' E longitude. The region has hilly terrain and receives the heavy rainfall ranging from 3000 to 4000 mm mostly during June to September. Total 720 km long seashore of Arabian Sea fall under the Konkan region of Maharashtra with average production of marine product of about 3.5 lakh tonnes per year. It is estimated that out of total marine products produced in the state, nearly 30 percent are dried and sold as a dried food in the market mostly during the off-season from June to September. Fish is highly perishable food product and it can be stored only by proper refrigeration or drying. Since most of the fishermen living at the coastal belt are below the poverty line therefore refrigeration is distinct dream to them therefore the only alternative is drying. In the experiment, the locally available 4 varieties of fish viz. Dhoma, Bangda, Kolambi, Surmai are selected. These four varieties were given unsalted and salted treatments in solar tunnel dryer and open sun drying. To reduce the processing losses during the drying and to retain the quality of dried product, it is necessary to dry the marine product in the close chamber with controlled condition. Due to higher temperature (550C) attained, the drying rate was higher for solar tunnel dryer compared to open sun drying. In solar tunnel dryer for variety Dhoma Drying rate is higher i.e. 55.65 g/h as compared to open drying i.e. 29.41 g/h. Similarly for variety drying rate for solar tunnel dryer is 33.03 g/h and for open drying is 26.49 g/h. Also for variety Kolambi drying rate for solar tunnel dryer is 128.65 g/h and for open drying is 35.67 g/h. Various drying curves concluded that, drying time

					required for drying of fish was minimum for solar tunnel dryer and maximum for open sun drying. For example in case of variety Dhoma tunnel dryer required 35 hr and open drying required 39 hr. Drying time required for salted fishes were more compared to unsalted fish. For example in case of variety Bangda in tunnel dryer salted treatment required 37 hr and unsalted treatment required 34 hr. In open sun drying method, moisture absorption during night is higher compared to solar tunnel dryer. In solar tunnel dryer contamination due to insects, birds, wind and the animals were not found as in case with open sun drying. Friedman's test was applied on organoleptic test data, which shows no significant difference in colour, texture and overall acceptability of solar dried and open sun drying prawns.
5	Ms. Patil A.S	M.Tech. (Renewable Energy)	2009-2010	Dr. Y.P. Khandetod,	Performance Evaluation of Solar Drying Parabolic Concentrating Cooker for Ethanol Preparation. Abstract: A research work was undertaken for "STUDY OF ETHANOL PRODUCTION FROM CASHEW APPLE JUICE USING SOLAR ENERGY." Renewable Energy in the form of solar energy is inexhaustible, non polluting in nature. Ethanol production from cashew apple juice was carried out on solar concentrating collector at the energy park of the Department of Electrical and Other Energy Sources, C.A.E.T., Dapoli. A solar concentrating collector having aperture diameter of 1.4 m, depth 0.35 m and focal length of 0.30 m was used. Production of ethanol involves two processes fermentation and distillation. The solar concentrating collector was tested for its performance at without load and with load (i.e. fermented

					cashew apple juice). During without load testing maximum temperature achieved in the system was 225°C. The full load performance of the system was evaluated with fermented cashew apple juice in container. During test the total distillation rate per day of the system was measured and it was obtained 1170 ml. The average distillation efficiency of the system was computed as 33.41 per cent. Water heating and cooling tests are performed to evaluate the performance of the parabolic concentrator in terms of overall heat loss factor (F'UL) and optical efficiency factor (F'no). The overall heat loss factor and optical efficiency factor (F'no) was found to be 12.83W/m2K and 12.02 per cent respectively. After using raw fermented cashew apple juice for ethanol production on concentrating solar cooker for distillation process, the ethanol percentage was increased up to 18.6 percent from initial 12 percent. After second distillation of product of first distillation, value of ethanol concentration was obtained 35.5 percent. Due to higher temperature, the water was evaporated along with ethanol. So it was not possible to get higher concentration of ethanol. Specific gravity and acid value of the 35.5 percent ethanol were determined and found to be 0.947 and 1.044 mg KOH/g respectively.
6	Mr. Gadakari P.B	M.Tech. (Renewable Energy)	2010-2011	Dr. A. G. Mohod,	Development and evaluation of gasifier based community cooking system. Abstract: Biomass is an important source of energy accounting for about one third of the total fuel used in India. The combustion process in traditional cooking stove called chulhah used for cooking is non-ideal and 41avouring incomplete combustion, with lower

					thermal efficiency and pollution. The thermo-chemical conversion of biomass through gasification using wood gas stove worked on the principle of gasification has low emission in comparison to traditional cook-stoves with higher thermal efficiency. The study of selected biomass based community cooking system was carried out to evaluate the mode of operation and their performance. The traditional cooking system available at Ratnadurg (2) boy's hostel, CAET, Dapoli was evaluated to estimate the energy requirement. Based on energy consumption pattern and cooking methodology, an open top gasifier for thermal application was developed, fabricated and techno-economically evaluated for its performance in laboratory and field. The study revealed that, all the traditional community cooking system consists of double pot made of mud and stones, with chimney as exhaust system to expel out the smoke. The traditional cooking systems utilize biomass as a main source of fuel and consume LPG as secondary fuel. The average thermal efficiency of traditional cooking system was found to be 14.14 per cent, which revealed the inefficient utilization of biomass. The proximate analysis and calorific value of babul (Acacia nilotica) revealed its suitability for gasification. The average thermal efficiency (21.86 per cent) of open top gasifier was found to be higher than traditional cooking system indicates the greater conversion of fuel in to heat, with clean environment. The field testing of open top gasifier revealed the saving of about 22 per cent of fuel wood (Acacia nilotica) over the traditional cooking system. The economic evaluation of open top gasifier revealed

					that, the net present worth (Rs.), internal rate of return (%), benefit-cost ratio and payback period was found to be Rs. 9,285.7/-, 105 per cent, 1.26 and 3.67 months, respectively and revealed its economic feasibility for cooking application.
7	Ms. Mehetre S.	M.Tech. (Renewable Energy)	2011-2012	Dr. S. H. Sengar,	Design and Development of improved carbonized cashew nut shell burning cooking stove. Abstract: Biomass is a major source of house holds energy in India. Biomass meets the cooking energy needs of most rural households and half of the urban households in India. More than half of the world's population, three billion people cook their food indoors using open fires or traditional stoves. But most of these stoves are inefficient and it leads to increased health hazards, drudgery in fuel collection, greater fuel requirement and ultimately deforestation. Improved cook stoves are safer and they provide more efficient combustion of alternative fuels in comparison with traditional stoves. The research work was undertaken to design and develop the improved cooking stove suitable for family size. The stove was fabricated and tested at Energy Park, Department of Electrical and Other Energy Sources, CAET, Dapoli. The performance of the improved stove has been tested with different feed stocks such as CNS char, mango sticks, commercial briquettes and arecanut shells. Thermal efficiency was determined by carrying out water boiling test for different feed stocks. Different parameters were recorded during WBT such as flame temperature, water temperature,stove surface temperature, remainingashand emissions. The power output of the

					developed stove was calculated with the help of thermal efficiency achieved. The actual cooking performance of the developed stove was observed with different feed stocks. The emissions evolved from the developed stove were recorded to check susceptibility for indoor air pollution. The study revealed that the thermal efficiency of developed cookstove was found as 28.83 per cent in natural convection and 31.21 per cent in supplementary secondary air convection with CNS char and the power output ratings for developed cook stove were found 2.65 kW in natural convection and 3.03 kW in supplementary secondary air convection with CNS char. The cooking test revealed that when CNS char was used as fuel, the time required to cook the food was 0.165 hr/kg and specific fuel consumption was 0.259 kg fuel per kg of cooked food which was minimumas compared to other feed stocks. The developed cook stove for different feed stocks produced less smoke than the benchmarks given by BIS. The economic evaluation of improved cook stove with CNS char as a fuel revealed that, the net present worth (₹), internal rate of return (%), benefit-cost ratio and payback period (year) was found to be ₹12742.1/-, 59 per cent, 1.79 and 1.42 years respectively and revealed its economic feasibility for cooking application.
8	Ms. Anjali subhash Kadam	M.Tech. (Renewable Energy)	2013-2014	Dr. Y.P. Khandetod,	Performance evaluation of solar tunnel dryer for drying of grapes
9	Ms. Namrata Chintaman Gawali	M.Tech. (Renewable Energy)	2013-2014	Dr. A.G. Mohod	Development and evaluation of biomass based composite water heater and dryer
10	Mr. V. R. Birwatkar	M.Tech. (Renewable	2014-15	Dr. Y.P.Kandeto	Development of

		Energy)		d	briquetting machine for locally available biomass.
11.	Mr. Sonawane Nitin Shantaram	M.Tech. (Renewable Energy)	2014-15	Dr. A.G. Mohod	Development and evaluation of biomass carbonization kiln.
12.	Ms. Bhangare B. M	M.Tech. (Renewable Energy)	2015-2016	Dr. A.G. Mohod	Development and Evaluation of Solar Photovoltaic Operated Weedicide Sprayer

Ph.D(Renewable Energy)

Sr. No.	**Name of Candidate:**	**Degree for which the thesis/project report submitted:**	**Year of submission:**	**Name of the Guide/CO-guide:**	**Title of Project**
1.	Mr. C. B.Khobragade	Ph.D (Renewable Energy)	2014-15	Dr. Y.P.Kandetod	Design and development of briquetting machine based on carbonized cashew nut shell and rice husk

9. Extension Activities

a. The training programmes organized

1	**Title:**	Distribution of SK-14 solar cooker programme.
	Sponsorer:	
	Date and Duration:	One day
	Participants:	20 Farmers in Konkan Region
	Schedule of the training programme:	
	Special feature of the training programme:	
	One photograph:	
2	**Title:**	Use of Concentrating Solar Cooker for CNSL

		extraction and Cooking
	Sponsorer:	
	Date and Duration:	4 days
	Participants:	20 Self Help Group from Cashew industry in Konkan Region
	Schedule of the training programme:	
	Special feature of the training programme:	
	One photograph:	
3	**Title:**	Application and Maintenance of Solar Energy for Cooking
	Sponsorer:	
	Date and Duration:	7 days
	Participants:	20 Farmers from Konkan Region
	Schedule of the training programme:	
	Special feature of the training programme:	
	One photograph:	

b. Seminar/Symposia/Conference/Workshop Organized

1	**Title:**	Two Day Workshop for Publicity of Wood Gasifier Technology.
	Sponsorer:	Appropriate Rural technology Institute (ARTI), Pune.
	Date and Duration:	13th and 14th March, 2014 2 days
	Participants:	Farmer, small interprener, self help group etc.

	Schedule of the Seminar/Symposia/Conference/Workshop:	13th and 14th March, 2014
	Key Note Speakers along with their topic of speech:	To provide/ disseminate Information on Biomass gasifier technology.
	No. of papers presented:	**45**
	Whether papers published in abstract/full length form? If so provide the details in bibliographical format.	**Nil**
	One photograph:	

c. Farmer Melawa Organized

1	**Title:**	
	Sponsorer:	**Nil**
	Date and Duration:	
	Participants:	
	Name of the speakers along with their topics	
	One photograph:	

d. Radio/TV talks delivered by the staff members of the Department/Section:

1. Radio talk on " Solar and Wind energy for Agriculture" All India Radio, 18.03.2010 by Dr. A.G. Mohod.
2. Radio talk on Renewable Energy Sources" All India Radio, 12.05.09 by Dr. A.G. Mohod
3. Radio talk on " Solar energy equipments for agriculture" All India Radio, 27.7.2007 by Dr. A.G. Mohod
4. Radio talk on " Saur Urjewar adharit walavani yantr", All India Radio, 29.12.2006 by Dr. A.G. Mohod.
5. TV Show on "Solar dryer for agril.application" ETV Marathi by Dr. A.G. Mohod.
6. TV Show on "Solar cookers for community application" ETV Marathi by Dr. A.G. Mohod.
7. TV Show on "Biomass gasifier for thermal application" ETV, Marathi by Dr. A.G. Mohod.
8. Radio talk on "SPV pump for agricultural use", All India Radio, 24 Mar., 2014 by Dr. A.G. Mohod.
9. TV Show on "Solar Dryer" Sanhyandri TV, Marathi by Dr. A.G. Mohod on 04 Dec. 2014.
10. TV Show on "SPV pump for agricultural use" Sanhyandri TV, Marathi by Dr. A.G. Mohod on 24 Mar. 2015.
11. TV Show on "Solar still for water purification" Sanhyandri TV, Marathi by Er. Hemant Y. Shrirame on 28 April, 2015.

e. Farmer-Scientist Forum: Nil

f. **Other Extension Activities:** The demonstration of renewable energy devices has been given to approximately 1,00,000 visitors.

g. Publications:

Books:

1. Agricultural Engineering Formulae, ISBN NO.: 8183600476, 2002-2003. (Co-auther for book Dr. **Y.P.Khandetod, Dr. A. G. Mohod, Ms. S. V. Aware *et al***)
2. Agricultural Engineering Question Bank, ISBN 81-86321-75-6, 2002. (Co-auther for book Dr. **Y.P.Khandetod, Dr. A. G. Mohod, Er. R.M.Dharaskar Ms. S. V. Aware *et al***)
3. Fundamentals of Wind Energy Utilization, Jain publishing house, New Delhi, 2010. Pages:158 (ISBN No: 978-81-8360-133-7) (Dr, A. G. Mohod, *et al*.)
4. Chapter entitled "Biofuel Production from Castor Seed Oil". Nova Science Publishers, Inc. New York, Page. 169-194, 2012, ISBN: 978-1-61470-435-5. (**Hemant Y. Shrirame** and N. L. Panwar)

Scientific Publications:

1 .A.G.Mohod, S.R.Gadge and S.P.Lambe (1999); Awareness and acceptability of improved cooking appliances in a village, Maharashtra J.of Extension Education, Vol.XVIII: 162-165 (ISSN 0971-3115)

2. S.R.Gadge, A.G.Mohod amd V.N.Madansure (2000); Liberation of Carbon Monoxide through gasifier-IC engine system. Conference Proceeding on Commercial Aspects of Renewable Energy Sources: 87-91

3. V.N.Madansure, D.M.Mahalle and A.G.Mohod (2000); Development of SPV tracking system using stepper motor, Conference Proceeding on Commercial Aspects of Renewable Energy Sources held at Udaipur (RAJ): 51-55

4. P.A.Borkar, V.N.Madansure and A.G.Mohod (2000); Energy consumption pattern in Bakery, Conference Proceeding on Commercial Aspects of Renewable Energy Sources held at Udaipur (RAJ): 142-145, ISBN-

5. S.R.Gadge and A.G.Mohod (2000);Study of Charcoal Preparation in Vidarbha region- A case Study, Proceeding of International Conference on Biomass Fuels and Cooking Stoves (BFCS 2000): 171-184 (ISBN

6. V.N.Madansure, A.G.Mohod, D.M.Mahalle and V.D.Patil (2001); Constrains in propagation of Solar Water Heating systems in Akola Dist.- A Case study, Proceeding of Energy Securities for India; Role of Renewable, Allied Publishers Limited, New Delhi:71-75 (ISBN-

7. V.N.Madansure, D.M.Mahalle, G.K.Majumdar, A.G.Mohod and D.P.Bondre (2003); Testing of modified Solar Photovoltaic powered Ultra Low Volume sprayer on chilli crop, J. of Institute of Engineeres and Telecommunication Engineers, Vol 2 No.3: 235-240 (ISSN 0256-4602).

8. A.G.Mohod, V.T.Badhe and A.G.Powar (2003); Design, Development and Evaluation of Rice Husk Stove, Energy Technologies for Sustainable Development, Prime Publishng House,Delhi-92:519-523 (ISBN 81-8229-000-7).

9. A.G.Mohod, S.R.Gadge and V.N.Madansure (2003); Liberation of Carbon Monoxide through gasifier-IC engine system, Journal of Institute of Engineers, Vol 84, November 2003: 27-29. (ISSN 0154-2310)

10. A.G.Mohod, V.T.Badhe and A.G.Powar (2004); Perceived advantages and disadvantages in adoption of Rice husk stove, Maharashtra J.of Extension Education, Vol.22: 127-128 (ISSN 0971-3115)
11. A.G.Mohod, S.R.Gadge and A.G.Powar (2004); Mass and Energy Balance of Charcoal Kiln for Carbonization: A Case Study, Power Machinery Systems and Ergonomics, Safety and Health, Anamaya Publisher, New Delhi (ISBN81-88342-50)
12.A.G.Mohod, R.G.Manjarekar and S.J.Tambe (2006), Scope and Preservation Techniques for Processed Fish Products, J. of BEVERAGE and FOOD WORLD, Vol.33(10),October 2006: 76-78 (ISSN-0970-6194)
13. A.G.Mohod, S.R.Gadge (2007); Thermal Energy Consumption Pattern in Biomass based Cotton Seed Dryer-A Case Study, Journal of Institute of Engineers, Vol 88, December 2007: 56-60. (ISSN 0154-2310)
14. A.G.Mohod, Y.P.Khandetod and A.G.Powar (2008). Processed cashew shell waste as fuel supplement for heat generation. J. of Energy for Sustainable Development. Vol.XII (4).2008: 73:76 ISSN: 09730826
15. S.H. Sengar, Y.P.Khandetod and A.G. Mohod , 2009, Construction and Evaluation of Rotary Solar Dryer For Fish Drying, Nigerian Food Journal, Vol 27(1): ISSN:0189-7241
16. S.H. Sengar, A.G. Mohod and Y.P.Khandetod, 2009, Vertical Rotary Low Cost Solar Dryer For Fish, Journal of fishing chimes, Vol.29 No.1: 148-151, ISSN:9714529
17. S.H. Sengar, Y.P.Khandetodand A.G. Mohod , 2009, Low Cost Solar Dryer for Fish, African Journal Environmental Science and Technology,Vol.3 (9): 265-271. ISSN:1996:0786
18. S.H. Sengar, A. G. Mohod, Y. P. Khandetod, V.T. Badhe and R. M. Dharaskar .2009. Design and Evaluation of singal basin solar distillation unit. Proceeding of International conference on Commercialization of Renewable Energy Technology, Kolhapur (MS),21-23 Oct.-2009:37-48.
19. S.P Modak, S. V Gupta, S. H. Sengar, A. G. Mohod and Y. P. Khandetod, 2009. Design and Development of Single Basin Wick Type Solar Desalination Plant, Proceeding of National Conference on Alternate Energy Sources For Rural Development. Jan 31st 2009. Pune:118-121.
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21. A.G.Mohod. 2009. Open top gasifier for thermal mapplication. COMPENDIUM of Winter School on Efficient Utilization of Farm Waste for Energy Generation. Dr.PDKV, Akola. Nov.10-30'2009:48-52
22. A.G.Mohod. 2009. Mass and energy balance of biomass briquetting process. COMPENDIUM of Winter School on Efficient Utilization of Farm Waste for Energy Generation. Dr.PDKV, Akola. Nov.10-30'2009:53-60.
23. A.G.Mohod ,Dr.Sudhir Jain, Dr.A.G.Powar, Dr.N.S.Rathore and Dr.A.K.Kuchania 2010. Cashew Nut Processing: Scope for renewable energy technologies.2010. Proceeding of 44th ISAE Annual convention And Symposium,New Delhi E – Paper sovenior. EA-2010-08.
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Annual convention and symposium, New Delhi Jan.28-30,2010: E – Paper Sovenior. EA-2010:61-71.
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Booklet/Bulletin/Folders (06)

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5. Published Booklet on "Saur Urja, Sadhane va Upayog" Director,Extension Education, Dr.B.S.K.K.V.,Dapoli, May,2006.
6. Published Booklet on "Saur Urjecha Swayampakasathi Upayog va dekhabhal" Deptt. of EOES,CAET,Dapoli, Kru.Aa.Ta.Ma./EOES/1/2006.

10. Details of other activities (for e.g. seed production, production of other commodities etc.): Nil

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12. News and Events: Nil