

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,  
CHHATRAPATI SAMBHAJINAGAR.**



**CIRCULAR NO.SU/ Sci./College/NEP-2020/105/2024**

It is hereby inform to all concerned that, In continuation circular No.SU./Revised B.Sc./NEP/72/2024/25588-96 dated 29.04.2024, the revised syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, the Academic Council at its meeting held on 08 April 2024 has accepted **the following Revised B.Sc. Course Structure & Curriculum** as per direction by the State Government dated on 13 March 2024 under the Faculty of Science & Technology (as per National Education Policy – 2020) run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1	<b>Non Conventional &amp; Conventional Energy (Single Major)</b>	Ist and IInd semester
2	<b>Home Science (Single Major)</b>	Ist and IInd semester
3	<b>Bachelor of Computer Application (Single Major)</b>	Ist and IInd semester
4	<b>Computer Science (Single Major)</b>	Ist and IInd semester
5	<b>Data Science (Single Major)</b>	Ist and IInd semester
6	<b>Inforamtion Technology (Single Major)</b>	Ist and IInd semester
7	<b>Networking and Multimedia (Single Major)</b>	Ist and IInd semester
8	<b>Automobile Technology (Single Major)</b>	Ist and IInd semester
9	<b>Forensic Science (Single Major)</b>	Ist and IInd semester
10	<b>Forensic Science &amp; Cyber Security (Single Major)</b>	Ist and IInd semester

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,  
Chhatrapati Sambhajanagar  
-431 004.  
Ref.No. SU/Sci./2024/27121-28  
Date:-27.05.2024.

\*  
\*  
\*  
\*  
\*  
\*  
\*  
\*  
\*  
\*  
\*

  
**Deputy Registrar,  
Academic Section.**

**Copy forwarded with compliments to :-**

- 1] **The Principal of all concerned Colleges,**  
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

**Copy to :-**

- 1] The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.
- 2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajinagar.
- 6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.
- 7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,  
CHHATRAPATI SAMBHAJINAGAR- 431004 (M. S.), INDIA**



**FACULTY OF SCIENCE AND TECHNOLOGY**

**B. Sc. Degree Programme**

[3 Years/4 Years (Honors)/4 Years (Honors with Research)]

As Per

National Education Policy-2020

**Revised**

**Course Structure and Curriculum**

**(As per NEP-2020)**

**Subject: Nonconventional and Conventional Energy**

**(Single Major)**

**For**

**B. Sc. First Year**

**(Semester-I and II)**

**Effective from Academic Year: 2024-25**

*Handwritten signature in blue ink, dated 2024, with the number 416 written below it.*

## STRUCTURE OF THE COURSE

### B.Sc. NCCE ( FIRST SEMESTER)

#### Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar

##### Course and credit distribution structure as per NEP-2020

Credit distribution for three/four year Honors with Research Degree Programme with multiple entry and exit options.

#### B.Sc. First Year (1<sup>st</sup> Semester)

#### Subject: Non Conventional and Conventional Energy

Course Type	Course Code	Course Name	Teaching Scheme ( Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major ( Core) M1 Mandatory	NCCET/M1/DSC-1/100	Fundamentals of Energy Systems-I	2		2		2+2 = 4
	NCCEP/M1/DSC-2/126	Practical based on DSC-1		4		2	
Major ( Core) M2 Mandatory	NCCET/M2/DSC-1/101	Mechanics & Properties of Matter	2		2		2+2 = 4
	NCCEP/M2/DSC-2/127	Practical based on DSC-1		4		2	
Major ( Core) M3 Mandatory	NCCET/M3/DSC-1/102	Chemistry-I: Thermodynamics and Electrochemistry	2		2		2+2 = 4
	NCCEP/M3/DSC-2/128	Practical based on DSC-1		4		2	
Generic / Open Elective ( GE/OE) (Choose any one from pool of courses) <b>It should be chosen compulsorily from the faculty other than that of Major</b>	NCCET/GE/OE-1/100	Differential Equation	2		2		2
SEC (Skill Enhancement Courses) (Choose any one from SEC-1 and accordingly choose relevant practical paper from SEC-2)	NCCET/SEC-1/100	1. Energy Conversion System-I 2. Bio-Energy	1		1		2
	NCCEP/SEC-2/126	1. Practicals based on Energy Conversion System-I 2. Practicals based on Bio-Energy		2		1	
AEC, VEC, IKS	AEC-1	English (Common for all the faculty)	2		2		2+2 =4
	IKS-1	Choose any one from pool of courses	2		2		
OJT/ FP/CEP/CC/RP	CC-1	Health and Wellness (Common for all the faculty)		4		2	2
			<b>13</b>	<b>18</b>	<b>13</b>	<b>09</b>	<b>22</b>

## STRUCTURE OF THE COURSE B.Sc. NCCE (Second Semester)

### Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajanagar

**Course and credit distribution structure as per NEP-2020**

Credit distribution for three/four year Honors with Research Degree Programme with multiple entry and exit options.

**B.Sc. First Year (II<sup>nd</sup> Semester) Subject: Non Conventional and Conventional Energy**

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major ( Core) M1 Mandatory	NCCET/M1/DSC-3/150	Fundamentals of Energy Systems-II	2		2		2+2 = 4
	NCCEP/M1/DSC-4/176	Practical based on DSC-3		4		2	
Major ( Core) M2 Mandatory	NCCET/M2/DSC-3/151	Heat & Thermodynamics	2		2		2+2 = 4
	NCCEP/M2/DSC-4/177	Practical based on DSC-3		4		2	
Major ( Core) M3 Mandatory	NCCET/M3/DSC-3/152	Chemistry-II : Physical & Inorganic Chemistry	2		2		2+2 = 4
	NCCEP/M3/DSC-4/178	Practical based on DSC-3		4		2	
Generic / Open Elective ( GE/OE) (Choose any one from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	NCCET/GE/OE-2/150	Differential Calculus	2		2		2
VSC ( Vocational Skill Courses) (Choose any one from VSC-1 and accordingly choose relevant practical paper from VSC-2)	NCCET/VSC-1/150	1. Energy Conversion System-II 2. Bio-Mass and Bio-Gas Technology	1		1		2
	NCCEP/VSC-2/176	1. Practicals based on Energy Conversion System II 2. Practicals on Bio-Mass and Bio-Gas Technology		2		1	
AEC, VEC, IKS	AEC-1	English (Common for all the faculty)	2		2		2+2 = 4
	VEC-1	Constitution of India (Common for all the faculty)	2		2		
OJT/ FP/CEP/CC/RP	CC-2	Yoga Education / Sports and Fitness(Common for all the faculty)		4		2	2
			<b>13</b>	<b>18</b>	<b>13</b>	<b>09</b>	<b>22</b>

Exit Option : Award of UG Certificate in 3 Majors with 44 credits and an additional 4 credits of core NCCE course / Internship OR continue with Major and Minor

GE/OE-1: This is a 2 credit theory course to be designed for other than that of faculty.

GE/OE-2: This is a 2 credit theory course to be designed for other than that of faculty.

**As PER NEP 2020**

**SEMESTER-I**

**Course Name: Fundamentals of Energy Systems-I**

Course Type: M1 Course Code: NCCET/M1/DSC-1/100

Total Contact Hours: 30 Hours/Week: 02 Total Credits: 02 Max. Marks: 50

**Learning Objectives of the Course:**

1. Identify at least five sources of energy.
2. Explain why an increased dependence on renewable energy sources is an inevitable part of our future.
3. Describe how the depletion of fossil fuels is a serious global issue.
4. Use and explain a mathematical model of a real-life phenomenon.
5. Identify and describe the parts of an energy system.

**Course Outcomes:** After completion of the course, students will be able to:

1. Understand the difference between renewable and non-renewable energies
2. Create awareness in understanding the types of renewable energy benefits of harvesting renewable energy
3. Understand the characteristics and operations of each type of renewable energy
4. Become aware of the importance of renewable energy generation.

Unit No.	Course Content	Contact Hours
I	<b>Conventional Energy Sources</b> <b>Energy Sources &amp; World Energy Status:</b> Energy Sectors: Domestic, Transportation, Agriculture, Industry, Energy Scenario, World Energy Present Situation, Availability of Conventional & Non-Conventional Energy Resources <b>Conventional Energy Sources:</b> Fossil Fuel, Hydro Resources, Nuclear Resources, Coal, Oil, Gas, Thermal Power Stations, Comparison of various conventional energy systems, their prospects and limitations, Advantages and Disadvantages of Conventional Energy Sources	10
II	<b>Non-Conventional Energy Sources</b> Solar Energy, Wind Energy, Energy from Biomass & Biogas, Ocean Thermal Energy Conversion, Tidal Energy, Geothermal Energy, Hydrogen Energy, Fuel Cell, Magneto Hydro-Dynamics Generator, Advantages & Limitations of Non-Conventional Energy Sources	10
III	<b>Fluid Mechanics</b> <b>Fluid Properties and Classification of Fluid</b> Definition of Fluid, Distinction between solids & fluid and liquid & gas fluid continuum, Mass density, Specific Volume, Viscosity, Newton's law of viscosity, Newtonian and Non-Newtonian Fluids, Ideal and Real fluids, Steady & Unsteady Flow, Uniform & Non-Uniform Flow, Laminar & Turbulent Flow, Compressible & Incompressible Flow, Surface tension, Definitions, units and dimensions.	10

**Learning Resources:**

1. Non-Conventional Energy Sources, **G. D. Rai, Khanna Publication.**
2. Non-Conventional Energy Resources, **B. H. Khan, The McGraw Hill Publishers.**

**Course Name: Practical based on DSC-1**

Course Type: M1 Course Code: NCCEP/M1/DSC-2/126

Total Contact Hours: 60 Hours/Week: 04 Total Credits: 02 Max. Marks: 50

**Learning Objectives of the Course:**

1. Learning objectives ideally describe a direction for the student acquiring new knowledge, skills, and attitudes.
2. Every decision you make about your lecture or small group session should depend on what you hope your students will be able to do as a result of your session.
3. Understand and explain general ways to save energy at a personal, community and global level. Identify and describe the parts of an energy system.

**Course Outcomes:** After completion of the course, students will be able to:

1. To expose students to elementary laboratory techniques
2. To identify physical concepts in their everyday experience.
3. To develop habits and practices that minimize uncertainty in physical measurements.

Expt. No.	Title of the Experiments
1.	Study of I-V characteristics of Solar Cell (Variation of Intensity, Distance between Source and Solar Cell, and load)
2.	Study of Power vs. Load characteristics of Solar Photovoltaic Systems.
3.	Study of Series and Parallel Combination of Solar Photovoltaic panels.
4.	To study the basic parameters of DC solar system.
5.	To study the concepts of AC solar system with solar inverter.
6.	Determination of viscosity of oil – Saybolt viscometer
7.	Calibration of Thermometers and pressure gauges.
8.	To study and find volumetric efficiency of a reciprocating air compressor.

**Course Name: Mechanics & Properties of Matter**

Course Type: M2      Course Code: NCCET/M2/DSC-1/101

Total Contact Hours: 30      Hours/Week: 02      Total Credits: 02      Max. Marks: 50

**Learning Objectives of the Course:**

1. Apply the equation of displacement, velocity and acceleration of the system in order to understand kinematics of the body under the various conditions of applied force.
2. Apply the knowledge in Newton's First, Second Law and third law, types of forces.

**Course Outcomes ( COs ) :**

After completion of the course, students will be able to –

1. Explain time and average velocity, average and instantaneous acceleration, acceleration vector
2. Explain Newton's I, II and III law of motion and its applications
3. Explain conservative and non-conservative forces, potential energy and conservation of mechanical energy

Unit No.	Course Content	Contact Hours
I	<b>Kinematics</b> Displacement, Time and Average Velocity (x-t graph illustrations to be included), 1.2 Instantaneous Velocity (Finding of velocity on an x-t graph), 1.3 Average and Instantaneous Acceleration (Illustration with v – t and a – t graph), 1.4 Motion with Constant Acceleration (Illustration with a – t and v – t graph), 1.5 Freely Falling Bodies (Up and Down motion in fall with y-t and vy-t graph), 1.6 Velocity and Position by Integration , 1.7 Position and Velocity Vectors, 1.8 Acceleration Vector 1.9 Problems	10
II	<b>Newton's laws of motion</b> Newton's First and Second Law and their explanation, Working with Newton's First and Second Law, Newton's Third Law of motion and its explanation with problems, Various types of forces in nature (explanation), Pseudo Forces (e.g. Centrifugal Force), Problems	10
III	<b>Work and Energy</b> 3.1 Kinetic Energy, 3.2 Work and Work-Energy Theorem, 3.3 Calculation of Work done with i) Constant Force ii) Spring Force, 3.4 Work-Energy Theorem, 3.5 Potential Energy, 3.6 Conservative and Non-conservative Forces, 3.7 Definition of potential energy and conservation of Mechanical energy, 3.8 Change in the potential energy in a rigid body motion, 3.9 Mass-energy equivalence, 3.10 Problems	10

**Learning Resources:**

1. University Physics, Sears and Zeemansky XIth edition, Pearson education.
2. Concepts of Physics H.C. Varma Bharati Bhavan Publishers
3. Problems in Physics P.K. Srivastava Wiley Eastern Ltd.



**Course Name: Practical based on DSC-1**

Course Type: M2 Course Code: NCCEP/M2/DSC-2/127

Total Contact Hours: 60 Hours/Week: 04 Total Credits: 02 Max. Marks: 50

**Learning Objectives:**

1. Identify and describe properties of matter, including: flexibility, strength, transparency, hardness, water resistance, size, color, weight, and texture.
2. Identify and describe properties of matter, including: flexibility, strength, transparency, hardness, water resistance, size, color, weight, and texture.
3. Identify and describe three phases of matter: solid, liquid, and gas.
4. Identify and describe examples of reversible and irreversible changes.

**Course Outcomes:** After completion of the course, students will be able to:

1. Study the elastic behaviour and working of torsional oscillations
2. Understand the Moment of Inertia and flat spiral spring.
3. Understand the surface tension and viscosity of fluid

Expt. No.	Title of the Experiments
1.	Range and Least Count of Instruments, Measurements using various instruments and error analysis (Vernier calliper, screw gauge, travelling microscope, spectrometer etc.)
2.	Determination MI of disc using ring
3.	Moment of Inertia of Flywheel
4.	Determination of coefficient of viscosity by Poiseulli's method
5.	Determination of Y and n by flat spiral spring
6.	Determination of Y by bending
7.	Surface Tension by Jeager's method.
8.	'g' by bar pendulum.
9.	Study of Modulus of Rigidity of wire using Torsional Oscillations
10.	Viscosity of liquid by rotating cylinder method.

**Course Name: Chemistry-I: Thermodynamics and Electrochemistry**

Course Type: M3 Course Code: NCCET/M3/DSC-1/102

Total Contact Hours: 30 Hours/Week: 02 Total Credits: 02 Max. Marks: 50

**Learning Objectives:** Students will learn the fundamental of thermodynamics

1. To understand different laws of thermodynamics.
2. To understand the concept of Electrochemistry

**Course Outcomes:** After completion of the course, students will be able to:

1. Explain first, second law of thermodynamics and entropy of systems
2. Explain physical significance of free energy
3. Explain electrolytic solution, conductivity and variation of conductivity

Unit No.	Course Content	Contact Hours
I	<b>Thermodynamics</b> 1.1 System and Surrounding. 1.2 First law of Thermodynamics: 1.3 Internal energy, Significance of internal energy change, 1.4 enthalpy, 1.5 Second law of Thermodynamics: 1.6 free energy, Entropy and Spontaneity, 1.7 Statement of second law based on entropy, 1.8 Entropy change in Phase transitions, 1.9 Entropy of fusion, entropy of vaporization, entropy of sublimation.	10
II	The concept of Gibbs's free energy- 2.2 Physical significance of free energy, 2.3 conditions for equilibrium & spontaneity based on $\Delta G$ values. 2.4 Effect of temperature on spontaneity of Reaction. 2.5 Third law of Thermodynamics.	10
III	<b>Electrochemistry</b> Conductance of electrolytic solution, 3.2 electrolytic conductivity (K), and molar conductivity of solutions of electrolytes. Variation of conductivity and molar conductivity with concentration. 3.4 Kohlrausch's law – application. Faraday's laws of electrolysis, 3.5 electrochemical equivalent and chemical equivalent, 3.6 transport number determination by Hittorf's method. 3.7 Applications of conductance measurements – Kw, Ksp. 3.8 Ostwald's dilution law, hydrolysis of salts.	10

**Learning Resources:**

1. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West, F.J. S.R. Holler, Crouch, 2006, 8th edn, Chapter 22 & 23, Thomson Brooks/Cole.
2. A Text Book of Quantitative Analysis including Instrumental Analysis, A.I. Vogel, 1961, John Wiley & Sons.
3. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma, M.S. Pathania, 2013, 46th edn. Chapter 13-16, Vishal Pub. Co.
4. Physical Chemistry, G. W. Castellan, 2004, 3rd edn., chapter 6-10, Narosa Publishing House, New

Delhi.

5. Thermodynamics, J. Rajaram and J. C. Kuriakose, 1986, Shoban Lal Nagin Chand & Co. Physical Chemistry, P. Atkins. J. Paula, 2006, 8th edn, chapter 2 & 3, Oxford University Press.
6. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma, M.S. Pathania, Vishal Pub. Co.
7. Introduction to Electrochemistry, S. Glasstone, 2011, chapter 2 & 3, Biblio Bazar.

**Course Name: Practical based on DSC-1**

[Chemistry-I (Thermodynamics and Electrochemistry)]

Course Type: M3 Course Code: NCCEP/M3/DSC-2/128

Total Contact Hours: 60 Hours/Week: 04 Total Credits: 02 Max. Marks: 50

**Learning Objectives of the Course:**

1. To introduce glassware and instruments used in a chemistry laboratory
2. To understand the importance of calibration of glassware and instrument to tune with the concept of precision and accuracy
3. Develop proficiency in fundamental of chemical laboratory techniques.

**Course Outcomes:** After completion of the course, students will be able to:

1. To prepare solution of desired concentration.
2. To maintain accurate and through records of experimental data and analyse results to draw meaningful conclusions.
3. To consistently follow established SOP's for various chemical experiments.

Expt. No.	Title of the Experiments
1.	Calibration of burette
2.	Calibration of pipette
3.	Calibration of standard measuring flask
4.	Calibration of thermometer
5.	Recognition of safety symbol, chemical packages, and instruments together with the conception of MSDS.
6.	Introduction to pictogram of chemical used ( acid, bases, solvents and salts)
7.	Demonstration of first aid measures of chemical accidents
8.	Demonstration of preventive measures for chemical spills
9.	Demonstration of first aid measures, when chemical materials entered in human body through eye, mouth and skin.
10.	Material safety data sheets with reference to hazards chemicals like benzene, cadmium nitrate, CCl <sub>4</sub> and mercury

**Learning Resources:**

1. F.G. Mann S.G. Saundars, Practical organic chemistry, Orient Longman
2. V.K. Ahluwalia and Sunita Dingara, Comparative Practical Organic Chemistry (Qualitative analysis), Orient Longman
3. V.K. Ahluwalia and Sunita Dingara, Comparative Practical Organic Chemistry (Preparation and Qualitative analysis), Orient Longman
4. Palit and De, Practical Physical Chemistry
5. Yadav, Practical Physical Chemistry
6. O.P. Pandey D.N. Practical Physical Chemistry (for B.Sc I,II and III students) Bajpaianad

**Course Name: Differential Equation**

Course Type: GE/OE-1      Course Code: NCCET/GE/OE-1/100

Total Contact Hours: 30      Hours/Week: 02      Total Credits: 02      Max. Marks: 50

**Learning Objectives:**

1. Understanding Basic Concepts: Students should grasp fundamental concepts such as what a differential equation is, types of solutions (general, particular, singular), and basic terminology (order, degree, linear vs. nonlinear).
2. Solving Techniques: Mastering various methods to solve differential equations, including separation of variables, integrating factors, substitution, exact equations, and series solutions.
3. Modeling Real-World Problems: Applying differential equations to model and solve real-world problems from various fields such as physics, engineering, biology, economics, and ecology.
4. Applications: Exploring applications of differential equations in diverse areas, including population dynamics, electrical circuits, mechanics, chemical reactions, heat transfer, and fluid dynamics

**Course Outcomes:** After completion of the course, students will be able to:

1. Understanding the fundamental concepts of differential equations, including types (ordinary, partial), order, linearity, and solutions.
2. Developing proficiency in solving various types of differential equations using analytical, numerical, and qualitative methods.
3. Applying differential equations to model and solve real-world problems from physics engineering, biology, economics, and other fields.
4. Enhancing problem-solving and critical thinking skills through the application of mathematical techniques to diverse problems.

Unit No.	Course Content	Contact Hours
<b>I</b>	Ordinary and partial differential equations, Order and degree of Differential equations, Solutions: general, particular, singular, Equations of the form, Equations homogeneous in $y$ and $x$ , Non homogeneous equations of the first degree in $y$ and $x$ and Exact differential equations, Integrating factors, Linear equations, Equations reducible to the linear form.	10
<b>II</b>	Linear equations defined, the complementary functions, particular integral, complete integral, The linear equations with constant coefficients and second member zero, case of auxiliary equation having equal roots, case of auxiliary equation having imaginary roots,	10
<b>III</b>	The symbol $D$ , the linear equation with constant coefficients and second member a function of $x$ , the symbolic function $1/f(D)$ , method of finding the particular integral, short methods of finding particular integrals corresponding to the terms $e^{ax}$ , $x^m$ , $\sin ax$ , $\cos ax$ , $e^{ax}V$ and $xV$ in the second member, The homogeneous linear equation, methods of finding solution, the symbolic functions $f(\theta)$ and $1/f(\theta)$ , methods of finding the particular integral, integral corresponding to	10

	a term of form $x^m$ in the second member, equations reducible to homogeneous linear form.	
<p><b>Text Books:</b></p> <p>1. D. A. Murray: Introductory Course in Differential Equations, Khosla Publishing House, New Delhi, 2006.</p> <p><b>Scope:</b></p> <p>Chapter 1: Articles 1, 4 Chapter 2: Articles 8-11, 14, 20, 21</p> <p>Chapter 6: Articles 49-53, 56-64 Chapter 7: Articles 65-71</p>		
<p><b>Learning Resources:</b></p> <ol style="list-style-type: none"> <li>1. M. D. Raisinghania: Ordinary and Partial Differential Equations, S. Chand and Company Limited</li> <li>2. George F. Simmons: Differential Equations with Applications and Historical Notes, Tata McGraw Hill Publishing House Limited</li> <li>3. Frank Ayers: Theory and Problems on Differential Equations, McGraw Hill</li> </ol>		

**Course Name: Energy Conversion System – I**

Course Type: SEC-1 Course Code: NCCET/SEC-1/100

Total Contact Hours: 15 Hours/Week: 01 Total Credit: 01 Max. Marks: 50

**Learning Objectives of the Course:**

1. Understanding the concept of electro mechanical energy conversion.
2. Apply the knowledge in different parameters DC generator
3. Apply knowledge in understanding the characteristics of dc generator

**Course Outcomes ( COs ) :**

After completion of the course, students will be able to -

1. Understand the difference between renewable and non-renewable energies
2. Understand the characteristics and operations of each type of renewable energy
3. Become aware of the importance of renewable energy generation

Unit No.	Course Content	Contact Hours
I	<b>ELEMENTS OF ELECTRO-MECHANICAL ENERGY CONVERSION</b> Introduction, Salient aspects of conversions, Energy- Balance, Magnetic-field System; Energy and Co-energy, A Simple Electromechanical System, Energy in Terms of Electrical Parameters, Rotary Motion Dynamic Equations and system-model of a simple system	5
II	<b>D.C. GENERATORS</b> Simple Loop Generator, Practical Generator, Yoke, Pole Cores and pole shoes, Pole Coils Armature Core, Armature Windings, Commutator, Brushes and Bearings, Armature windings Pole-pitch, Conductor, Types of Generators, Separately- excited, Self-excited generators, Shunt Wound, Series Wound, Compound Wound Measurement of Generator Efficiency, Irons Loss in Armature,	5
III	<b>Generator Characteristics</b> Characteristics of Dc Generators, separately excited generators 1) Non load saturation characteristic 2) load saturation curve, Internal and external characteristics.	5

**Learning Resources:**

1. Text Book of “**Electrical Technology**” Vol. II, B.L. Theraja & A.K. Theraja, S. Chand Publications.
2. “**Electrical Machines**” by P. S. Bhimbra.

**Course Name: Bio-Energy**

Course Type: SEC-1      Course Code: NCCET/SEC-1/100

Total Contact Hours: 15      Hours/Week: 01      Total Credit: 01      Max. Marks: 50

**Learning Objectives:**

1. Bioenergy can contribute to a more secure, sustainable, and economically-sound
2. It provides domestic clean energy sources,
3. Its primary objective is to reduce energy intensity in the economy.

**Course Outcomes:** After completion of the course, students will be able to:

1. It provides energy security.
2. It reduces greenhouse gas emissions.
3. It supports the agricultural industry
4. Bioenergy is beneficial for farmers

Unit No.	Course Content	Contact Hours
I	<b>Energy from Biomass –I</b> Introduction, Biomass Conversion Technologies, Photosynthesis, Biogas Generation, Factors Affecting Bio-digestion or Generation of Gas Classification of Biogas Plants, Advantages and Disadvantages of Floating Drum Plant Advantages, Advantages and Disadvantages of Fixed Dome Type Plant.	5
II	<b>Energy from Biomass –II</b> Types of Biogas Plants, Constructional Details of some Main Digesters Bio-gas from Plant Wastes, Community Biogas Plants, Materials Used for Bio-gas Generation, Selection of Site for a Biogas Generation	5
III	<b>Energy from Biomass –III</b> Digester Design Considerations, Methods for Maintaining Biogas Production, Problem Related to Bio-gas Plants, Starting a Biogas Plant, Filling a Digester for Starting, Fuel Properties of Bio-gas, Utilization of Biogas.	5

**Learning Resources:**

1. Non-Conventional Energy Sources, **G. D. Ray, Khanna Publications.**
2. Non-Conventional Energy Resources, **B.H. Khan, The McGraw Hill Publications**
3. “Renewable Energy Resources” by John Tidwell and Tony Weir, 2nd edition, Fspn & Co.
4. Khandelwal, K.C., Mahdi, S.S., Biogas Technology – A Practical Handbook, Tata McGraw-Hill, 1986.
5. R. C. Mahaeswari, Bio Energy for Rural Energisation, Concepts Publication, 1997.
6. Tom, B. Reed, Biomass Gasification – Principles and Technology, Noyce Data Corporation, 1981
7. Best Practises Manual for Biomass Briquetting, I R E D A, 1997.
8. S. Eriksson and M. Prior, The briquetting of Agricultural wastes for fuel, FAO Energy and Environment paper, 1990.
9. “Energy conversion systems” by Rakosh das Begamudre, New age international publishers, New Delhi - 2000.

**Course Name: Practicals based on SEC-1  
(Energy Conversion System-I & Bio-Energy)**

Course Type: SEC-2    Course Code: NCCEP/SEC-2/126

Total Contact Hours: 30    Hours/Week: 02    Total Credits: 01    Max. Marks: 50

**Learning Objectives:**

1. Identify and describe different types of energy conversion
2. Describe generator, electrical energy and different bio gas plant
3. Identify and describe examples of reversible and irreversible changes.

**Course Outcomes:** After completion of the course, students will be able to:

1. Study the electric to mechanical changes
2. Understand the potential and kinetic energy
3. Understand the power plant for using fertilizer biogas

Expt. No.	<b>Title of the Experiments</b>
1.	Light bulb: electric to light.
2.	Fan: electric to mechanical.
3.	Muscle movement: chemical to mechanical.
4.	Ball falling: potential to kinetic.
5.	Generator: Mechanical to electric.
6.	Automobile: Chemical to Electric.
7.	Torchlight: Electric to light.
8.	Stove: Chemical to Heat and Light.

**Course Name: Practical based on SEC-1  
(Bio-Energy)**

Course Type: SEC-2 Course Code: NCCEP/SEC-2/126

Total Contact Hours: 30 Hours/Week: 02 Total Credits: 01 Max. Marks: 50

**Learning Objectives of the Course:**

1. Identify and describe different types of energy conversion
2. Describe generator, electrical energy and different bio gas plant
3. Identify and describe examples of reversible and irreversible changes.

**Course Outcomes:** After completion of the course, students will be able to:

1. Study the electric to mechanical changes
2. Understand the potential and kinetic energy
3. Understand the power plant for using fertilizer biogas

Expt. No.	Title of the Experiments
1.	Biogas plant for segregated municipal waste
2.	Spent wash based biogas plant with purification and bottling facility
3.	Fixed Dome Type Plant
4.	Biogas fertilizer power plant
5.	Floating Drum Plant
6.	Field Visit One or more of the following visits may be undertaken.

**As PER NEP 2020**

**SEMESTER-II**

**Course Name: Fundamentals of Energy Systems-II**

Course Type: M1 Course Code: NCCET/M1/DSC-3/150

Total Contact Hours: 30 Hours/Week: 02 Total Credits: 02 Max. Marks: 50

**Learning Objectives of the Course:**

1. To improve the efficiency of a process for the transformation between energy and work.
2. To study energy conversion in different forms.
3. To study the laws of perfect gas
4. To study heat transformation in other forms

**Course Outcomes:** After completion of the course, students will be able to:

1. Use thermodynamic terminology correctly.
2. Create awareness in understanding the types of renewable energy benefits of harvesting renewable energy
3. Understand the characteristics and operations of conversation of energy
4. Become aware of the importance of renewable energy generation.

Unit No.	Course Content	Contact Hours
I	<b>Introduction &amp; Laws of Thermodynamics</b> Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Thermodynamic Equilibrium, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Types, Work and Heat, Point and Path function, Concept of quality of Temperature, Principles of Thermometry, Const. Volume gas Thermometer, Ideal Gas Scale, Joule’s Experiments Steady Flow Energy Equation, Limitations of First Law of Thermodynamics, Thermodynamic scale of Temperature, Clausius Inequality, Entropy	10 Hrs
II	<b>Laws of Perfect Gas</b> Perfect Gas Laws, Specific and Universal Gas Constants, Heat and Work Transfer, changes in Internal Energy, Throttling and Free Expansion Processes, Flow processes, Deviations from perfect Gas Model, Vander Waals Equation of State, Mixtures of perfect Gases, Avogadro’s Laws of additive volume, Dalton’s and Amagat’s laws	10 Hrs
III	<b>Heat Transfer</b> <b>Conduction of heat transfer:</b> Various modes of heat transfer, Mechanisms of different modes of heat transfer, Fourier’s law of heat conduction, Conductivity, Electrical Analogy, Concept of thermal Resistance, Introduction of newton’s Law of cooling, <b>Convection:</b> Basic Concepts: Convective Heat Transfer coefficients, Boundary layer Concept, Types of Convection, Forced Convection, Laminar and Turbulent flow, Combined Laminar and Turbulent, Nusselt Theory, Film Wise and Drop Wise condensation	10 Hrs

**Learning Resources:**

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Fundamentals of Thermodynamics – Sonntag, Borgnakke and van wylen / John Wiley & Sons (ASIA) Pvt. Ltd.
3. Engineering Thermodynamics – Jones & Dugan
4. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
5. Thermodynamics – J .P. Holman / McGraw Hill

**Course Name: Practical based on DSC-3**

Course Type: M1 Course Code: NCCEP/M1/DSC-4/176

Total Contact Hours: 60 Hours/Week: 04 Total Credits: 02 Max. Marks: 50

**Learning Objectives:**

1. Learning objectives ideally describe a direction for the student acquiring thermal conductivity.
2. Every decision you make about your lecture or small group session should depend on what you hope your students will be able to do as a result of your session.
3. Understand and explain general ways to save energy at a personal, community and global level. Identify and describe the parts of an energy system.

**Course Outcomes:** After completion of the course, students will be able to:

1. Understand basic concept of heat transfer
2. Understand the working of various parts of boiler mounting & accessories. .
3. To develop habits and practices that minimize uncertainty in physical measurements.

Expt. No.	Title of the Experiments
1.	Determination of dryness fraction of steam (At least two Calorimeters).
2.	Study of Boiler Mountings.
3.	Study of Boiler Accessories.
4.	To determine temperature of sodium flame.
5.	Thermal Conductivity by Forbe's method
6.	Thermal Conductivity by Lee's Disc method
7.	Newton's law of cooling experiment
8.	To determine the temperature coefficients resistance of Platinum resistance thermometer by using Carey foster's bridge

## Course Name: Heat & Thermodynamics

Course Type: M2 Course Code: NCCET/M2/DSC-3/151

Total Contact Hours: 30 Hours/Week: 02 Total Credits: 02 Max. Marks: 50

### Learning Objectives of the Course:

1. Students know the basic terms and meanings (e.g. heat, temperature, conduction, convection, radiation).
2. It provides domestic clean energy sources,
3. Students explain how heat transfers.

**Course Outcomes:** After completion of the course, students will be able to:

1. Explain thermodynamic systems, properties, Zeroth law of thermodynamics, temperature scales and energy interactions.
2. Determine heat, work, internal energy, enthalpy for flow & non-flow process using First and Second Law of Thermodynamics.

Unit No.	Course Content	Contact Hours
I	<b>Basic Concepts of Thermodynamics</b> Thermodynamic state of a system, Thermal Equilibrium, Zeroth law of Thermodynamics, Internal Energy of System-Concept of heat, Equation of State: The Ideal Gas Equation, Indicator Diagram, First law of Thermodynamics, Thermodynamic Process-Isothermal, Adiabatic, Isobaric, Isochoric. Adiabatic relations of system for perfect gas. Work done during Isothermal and Adiabatic changes. Reversible and Irreversible changes.	10
II	<b>Second Law of Thermodynamics: Entropy</b> Conversion of Heat into Work and its converse, Reversible and Irreversible Processes. Examples of Irreversible Processes., Carnot's Cycle and Carnot's Heat Engine and its efficiency, Second law of Thermodynamics: Statements, Carnot Theorem, Entropy, Principle of Increase in Entropy, Generalized form of the First and Second laws: i Entropy changes for an Ideal Gas. ii Entropy of van der Waals' gas.	10
III	<b>Heat engines &amp; Refrigerators</b> Heat Engines, Otto cycle and its efficiency, Diesel cycle and its efficiency, Comparison between Otto and Diesel cycle, Refrigerators	10

### Text Book

1. Physics, 4th Edition, Volume I, Resnick/Halliday/Krane JOHN WILEY & SONS (SEA) PTE LTD.
2. Heat and Thermodynamics Mark. W. Zemansky, Richard H. Dittman Seventh Edition, McGraw-Hill International Editions.
3. Thermal Physics (Heat & Thermodynamics) A.B. Gupta, H.P. Roy Books and Allied (P) Ltd, Calcutta.

**Learning Resources:**

1. Heat and Thermodynamics Brijlal, N. Subrahmanyam S. Chand & Company Ltd, New Delhi.
2. Thermodynamics and Statistical Physics J.K. Sharma, K.K. Sarkar, Himalaya Publishing House.
3. Concept of Physics H.C. Verma Bharati Bhavan Publishers

**Course Name: Practicals based on DSC-3**

(Heat & Thermodynamics)

Course Type: M2 Course Code: NCCEP/M2/DSC-4/177

Total Contact Hours: 60 Hours/Week: 04 Total Credits: 02 Max. Marks: 50

**Learning Objectives of the Course:**

1. To understand fluids, its properties and fluid statics.
2. To analyze Kinematics and Dynamics of fluid flow.
3. It gives the foundation for heat engines, refrigerators, and many more important concepts that the world we live in today relies on.
4. To understand thermodynamics requires knowledge of how the microscopic world operates.

**Course Outcomes:** After completion of the course, students will be able to:

1. Summarize the basic concepts of energy, its distribution and general Scenario.
2. Summarize the environment eco system and its need for awareness.
3. Identify the various types of environment pollution and their effects.

Expt. No.	Title of the Experiments
1.	Study of thermal conductivity of a given metal
2.	Interpretation of Isothermal and Adiabatic curve on P-V diagram and theoretical study of Carnot's cycle by drawing graphs of Isothermal and Adiabatic curves
3.	Study of temperature coefficient of Thermistor.
4.	Study of Thermocouple and determination of inversion temperature
5.	Study of specific heat of Graphite
6.	Study of Solar constant
7.	Determination of calorific values of different fuel
8.	Joule's experiment to validate first law of thermodynamics.

**Learning Resources:**

1. Heat and Thermodynamics Brijlal, N. Subrahmanyam S. Chand & Company Ltd, New Delhi.
2. Concept of Physics H.C. Verma Bharati Bhavan Publishers

**Course Name: Chemistry-II  
(Physical & Inorganic Chemistry)**

Course Type: M3 Course Code: NCCET/M3/DSC-3/152

Total Contact Hours: 30 Hours/Week: 02 Total Credits: 02 Max. Marks: 50

**Learning Objectives:**

1. To study the various factors which affect the rate of a chemical reaction such as concentration, temperature, solvent, catalyst etc. And theories of chemical kinetics. .
2. To understand thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials.
3. To understand the concept of equilibrium constant, free energy, chemical potential

**Course Outcomes:** After completion of the course, students will be able to:

1. Know the thermodynamics and its application in all feasible systems students will also learn of all specific features of carbon and compounds.
2. To learn chemical energetics they will learn about the principle of equilibrium.
3. Students will know the chemical reaction involved in preparation and properties of these compounds.

Unit No.	Course Content	Contact Hours
<b>I</b>	<b>Chemical Mathematics</b> Logarithm: Rules of logarithm, Characteristic and mantissa, Change of sign 1.2 Graphical representation of equations, Rules for drawing graph co-ordinates etc, 1.3 Equation of straight line, slope and intercept, plotting the graph from the data of chemical properties and problems, 1.4 Derivative: Rules of differentiation and partial differentiation, Algebraic, logarithmic and exponential functions and problems 1.5 Integration: rules of integration, Algebraic and exponential functions and problems,	10
<b>II</b>	<b>Gaseous and Liquids State:</b> Ideal and non-ideal gas, deviation of gases, from ideal behavior, compressibility factor (Z), van der Waals equation of state and its application to explain deviation of gases, Critical constant of gas in terms of van der Waal's constant, Experimental determination of Pc, Tc and Vc, Reduced equation of state, Law of corresponding state, Measurable physical properties of liquid such as vapour pressure, surface tension and viscosity and their experimental determination (One method of each)	10
<b>III</b>	<b>Chemical Thermodynamics</b> 3.1 second law of thermodynamics, Carnot's cycle and its efficiency, mechanical efficiency 3.2 Entropy changes, for system and surrounding for reversible and irreversible process, 3.3 Entropy changes for an ideal gas in isothermal, isobaric and isochoric changes, 3.4 Entropy changes in chemical reactions. Entropy changes accompanying fusion,	10

**Learning Resources:**

1. Mathematical preparation for physical chemistry by Daniel, McGraw Hill publication
2. University general Chemistry, by C.N.R.Rao Mc. Millan Publication
3. Principles of physical chemistry. By Maron and Pruton 4<sup>th</sup>Ed.Oxford and IBH publication
- 4.. Physical chemistry, By G.M. Barrow

**Course Name: Practicals based on DSC-3**  
(Physical & Inorganic Chemistry)

Course Type: M3    Course Code: NCCEP/M3/DSC-4/178

Total Contact Hours: 60    Hours/Week: 04    Total Credits: 02    Max. Marks: 50

**Learning Objectives of the Course:**

1. Students will be empowered with basic to advance knowledge of physical and inorganic chemistry.
2. To elaborate chemistry of dilute solutions, processes involved in equilibrium states and their electrochemical properties and
3. To explore the chemistry of acids and amines

**Course Outcomes:** After completion of the course, students will be able to:

1. Elaborate chemistry of ideal and non-ideal solutions and apply the concept of phase equilibrium in various systems
2. Explore electrochemical aspects of dilute solution
3. Explore chemistry of amines and amino acids .

Expt. No.	Title of the Experiments
1.	Determination of enthalpy of neutralization of HCl and NaOH.
2.	Determination of enthalpy of neutralization of CH <sub>3</sub> COOH and NaOH.
3.	Determination of enthalpy of hydration of CuSO <sub>4</sub> .
4.	Determination of equivalent weight of Mg by Eudiometer.
5.	Estimation of oxalic acid by titrating it with KMnO <sub>4</sub> .
6.	Estimation of water of crystallization in Mohr's salt by titrating it with KMnO <sub>4</sub> .
7.	Estimation of Fe <sup>+2</sup> ion by titrating it with K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> using internal indicator.
8.	Estimation of Cu <sup>+2</sup> ion iodometrically using Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> .
9.	Estimation of zinc by using EDTA solution using EBT indicator.

**Learning Resources:**

1. Physical chemistry, By G.M. Barrow.
2. Principles of physical chemistry. By Maron and Pruton 4<sup>th</sup>Ed.Oxford and IBH publication
3. Essentials of Volumetric Analysis by Henry William Schimpf
4. An Introduction to Chemical Thermodynamics by R P Rastogi and R R Mishra ,Vikas Publishing House.

**Course Name: Differential Calculus**

Course Type: GE/OE-2 Course Code: NCCET/GE/OE-2/150

Total Contact Hours: 30 Hours/Week: 02 Total Credits: 02 Max. Marks: 50

**Learning Objectives:**

1. Understanding Limits and Continuity: Grasping the concept of limits and their role in defining continuity of functions, including one-sided limits and limits at infinity.
2. Differentiation Techniques: Mastering various techniques for differentiation, including the power rule, product rule, quotient rule, chain rule, implicit differentiation, and trigonometric differentiation.
3. Application of Derivatives: Applying derivatives to solve problems related to rates of change, optimization, related rates, curve sketching, and approximation using linearization.
4. Higher-Order Derivatives: Extending differentiation techniques to higher-order derivatives, including nth derivatives and applications in analyzing higher-order behavior of functions.
5. Understanding the fundamental concepts of vectors, including vector operations such as addition, subtraction, scalar multiplication, and vector components.
6. Application of vector differentiation to solve problems in physics, engineering, computer graphics, and other fields where vector analysis is crucial.

**Course Outcomes:** After completion of the course, students will be able to:

1. Mastery of the fundamental concepts of calculus, including limits, continuity, derivatives, and their applications.
2. Proficiency in calculating derivatives of various functions using differentiation rules, including power, product, quotient, chain rules, and implicit differentiation.
3. Understanding the geometric interpretation of derivatives as slopes of tangent lines and rates of change.
4. Ability to use vector calculus identities and properties to simplify expressions and solve problems involving vector derivatives.

Unit No.	Course Content	Contact Hours
I	Derivative of a function, derived function, derivability implying continuity, geometrical interpretation of a derivative, hyperbolic functions, derivatives of hyperbolic and inverse hyperbolic functions, logarithmic differentiation, derivative of implicit functions, Successive Differentiation, Higher order derivatives, Calculation of nth derivatives: Some standard results, Determination of nth derivatives (Some standard results), Leibnitz's Theorem [1]	10
II	Vector function of a single scalar variable, Continuity, Differentiability, Derivative of the sum(or difference) of vectors, Derivative of the scalar product, Derivative of the cross product, Derivative of scalar triple product, Derivative of vector triple product [2].	10
III	Scalar and vector field, level surfaces, vector function of two or more variables,	10

partial derivatives of vectors, geometrical interpretation of Directional derivative, Operator $\nabla$ , the gradient, Properties of gradient, The divergence, Properties of Divergence, Curl, Properties of Curl [2]	
--	--

**Text books:**

[1] Shanti Narayan: **Differential Calculus, Shyamlal Charitable Trust, 2004**

**Scope:** Chapter 4: Articles 4.1, 4.11, 4.12, 4.14, 4.15, 4.7, 4.71, 4.72, 4.9, 4.10

Chapter 5: Complete

[2] N. Saran, R. Prasad: **Elements of Vector Calculus (Fifth Edition), Pothishala Pvt. Ltd. 2016**

**Scope:** Chapter 1: Article 1.1, 1.2, 1.3, 1.32, 1.61, 1.62, 1.63, 1.64

Chapter 2: Article 2.1, 2.11, 2.2, 2.21, 2.22, 2.23, 2.3, 2.31, 2.33, 2.4, 2.41, 2.5, 2.51

**Learning Resources:**

1. Gorakh Prasad: Differential Calculus (Revised Edition), Pothishala Pvt. Ltd., 2018
2. Shanti Narayan and P. K. Mital: A Text Book of Vector Calculus, S. Chand and Company Ltd. New Delhi

**Course Name: Energy Conversion System–II**

Course Type: VSC-1 Course Code: NCCET/VSC-1/150

Total Contact Hours:15 Hours/Week: 02 Total Credits: 01 Max. Marks: 50

**Learning Objectives:**

1. To develop skill and capacity for effective energy conservation
2. To impart knowledge in the domain of energy conservation
3. To know various types of energy losses and the associated energy efficient technologies for the routinely used thermal and electrical energy systems."

**Course Outcomes:** After completion of the course, students will be able to:

1. To keep the knowledge of students upgraded with the current thoughts and newer technology
2. To understand the fundamental theory of energy storage technologies.
3. To develop skill and capacity for effective energy conservation

Unit No.	Course Content	Contact Hours
I	<b>SPEED CONTROL OF D.C. MOTORS</b> Factors Controlling Motor Speed, Speed Control of Shunt motors, Variation of flux or Flux Control Method, Armature or Rheostatic Control Method, Voltage Control Method, Speed Control or series Motors, Flux Control Method, Variable Resistance in series with motor, Measurement of Motor Efficiency	5
II	<b>TRANSFORMER</b> Working principle of a Transformer, Transformer Construction, Core-type Transformers, Shell-type Transformers, Elementary Theory of an ideal Transformer, D.M.F. Equation of Transformer, Voltage Transformation Ratio (K), Transformer with losses but no magnetic Leakage, Transformer on No-load, Transformer on load, Transformer with winding resistance but no Magnetic leakage, Magnetic leakage, Transformer with resistance and leakage reactance, Estimation of Transformer Efficiency (at Full Load & Actual Load.	5
III	<b>Transformer Three phase</b> Three phase transformer connections, star/star or Y/Y connection, Delta-Delta connection, Wye/Delta connection, Delta/why connection.	5

**Learning Resources:**

1. Text Book of "Electrical Technology" Vol. II, B.L. Theraja & A.K. Theraja, S. Chand Publications.
2. "Electrical Machines" by P. S. Bhimbra.

**Course Name: Practical based on VSC-1**

(Energy Conversion system-II)

Course Type: VSC-2 Course Code: NCCEP/VSC-2/176

Total Contact Hours: 30

Hours/Week: 02

Total Credit: 01

Max. Marks: 50

**Learning Objectives:**

1. To expose the students to the basics of units, measurements and electrical circuits
2. To expose the students to various electronic components, its working and some of the applications
3. To encourage implementation and proper and efficient use of energy.

**Course Outcomes:** After completion of the course, students will be able to:

1. Study the single phase transformer
2. Understand the Power and phase in three phase system
3. Understand the water heating plant & cooking gas project.

Expt. No.	Title of the Experiments
1.	Determination of dryness fraction of steam (At least two Calorimeters).
2.	Study of Boiler Mountings.
3.	Study of Boiler Accessories.
4.	To determine temperature of sodium flame.
5.	To demonstrate cut-out sections of single phase transformer.
6.	To measure relationship between phase and line, currents and voltages in three phase system (star & delta)
7.	To measure Power and phase in three phase system by two wattmeter method.
8.	To find the equivalent circuit parameters by conducting OC and SC test on single phase transformer
9.	To demonstrate cut-out sections of DC machine.
10.	Mutual inductance by BG.

**Course Name: Practical based on VSC-1**

(Bio-Mass and Bio-Gas Technology)

Course Type: VSC-2 Course Code: NCCEP/VSC-2/176

Total Contact Hours: 30 Hours/Week: 02 Total Credit: 01 Max. Marks: 50

**Learning Objectives of the Course:**

1. To expose the students to the basics of units, measurements and electrical circuits
2. To expose the students to various electronic components, its working and some of the applications
3. To encourage implementation and proper and efficient use of energy

**Course Outcomes:** After completion of the course, students will be able to:

1. Study the single phase transformer.
2. Understand the Power and phase in three phase system.
3. Understand the water heating plant & cooking gas project.

Expt. No.	Title of Experiments
1.	To study rural areas as cooking gas.
2.	To study the production of electricity by bio gas
3.	To study bio gas can be used in instruments used for water heating, space (room) heating etc.
4.	To study biomass conversion technologies
5.	To study Bio-Gas production process
6.	To visit Bio-Gas production plant

*B. N. Le*  
4/6 2024