SHRI VISHWAKARMA SKILL UNIVERSITY

(A State Govt Skill University Established by Govt. of Haryana)

Skill Department of Green Technology

(Skill Faculty of Engineering &

Technology)

Scheme and Syllabus of B. Voc. (Solar Technology)

Duration of the course: 6 Semesters (3 Years)

Batch 2024-25 onwards

SEMESTER-I

Course Code	Course Name	Credits				Hrs				Marks						
										Theory(T)			Practical(P)			Total
		L	T	P	TO	L	T	P	TO	I	E	TO	I	E	TO	(T+P)
24USTD01	Thermodynamics (DMC)	3	0	0	3	45	0	0	45	30	70	100	0	0	0	100
24UELE12	Basic Electrical and Electronics Engineering (DMC)	3	0	0	3	45	0	0	45	15	35	50	0	0	0	50
24USPV02	Fundamental of Solar Panel (DMC)	3	0	0	3	45	0	0	45	15	35	50	0	0	0	50
24UMTH01	Mathematics-I (MDC)	2	1	0	3	30	15	0	45	30	70	100	0	0	0	100
24UYSH01	Yoga and Health Skills- II (VAC)	2	0	0	2	30	0	0	30	30	70	100	0	0	0	100
24UENG01	English Language and Communication Skill (AEC)	1	0	0	1	15	0	0	15	15	35	50	0	0	0	50
24USGD04	Engineering Graphics and Design (DMC)	0	0	2	2	0	0	60	60	0	0	0	70	30	100	100
24UBEE13	Basic Electrical and Electronics Engineering Lab (DMC)	0	0	1	1	0	0	30	30	0	0	0	35	15	50	50
24USPV03	Fundamental of Solar Panel Lab (DMC)	0	0	1	1	0	0	30	30	0	0	0	35	15	50	50
24UENG02	English Language and Communication Skill Lab (AEC)	0	0	1	1	0	0	30	30	0	0	0	35	15	50	50
	Total	15	0	5	20	210	15	150	375	135	315	450	175	75	250	700

SUBJECT: Thermodynamics
CODE: 24USTD01
CATEGORY: DMC

Credit	Hours	Marks		
3	45	I	E	TO
		30	70	100

Course objective:

This course deals with the fundamentals of Thermodynamics including thermodynamic systems and properties, the laws of thermodynamics and applications of these basic laws in evaluating the energy interactions between engineering systems and surroundings

Expected Learning Outcomes

After successful completion of this course the students will be able to:

1. Explain fundamental concepts relevant to thermodynamics and determine displacement work involved with moving boundary systems.
2. Explain the first law of thermodynamics for a closed system and perform energy analysis of refrigeration and heat pumps
3. Apply the first law of thermodynamics for a control volume, including with turbines, compressors, nozzles, diffusers, heat exchangers, and throttling devices.
4. Explain the second law of thermodynamics, the concept of entropy, and calculating efficiency of heat engines and COP of heat pumps and refrigerators
5. Determine thermodynamic properties of pure substances.
6. Evaluate the efficiencies of various thermodynamics cycles

Unit-I Fundamental Concepts

Thermodynamics: Definition and scope, Macroscopic versus Microscopic view point, Thermodynamic system and control volume, thermodynamic properties processes and cycles, thermodynamic equilibrium, pure substance, Zeroth law of thermodynamics, pressure and temperature scales, Work transfer, pdV- work or displacement work, free expansion work, heat transfer, specific heats and latent heat.

Unit –II First Law of Thermodynamics

First law of thermodynamics for a closed system undergoing a cycle, first law for a closed system undergoing a process, Energy, Enthalpy, Specific heats at constant pressure and constant volume.
First Law applied to flow processes- steady flow process, Mass and Energy balance in a steady flow process, application of steady flow energy equation to engineering systems.

Unit –III Second Law of Thermodynamics

Introduction, Energy reservoirs, Heat engines, Kelvin Planck Statement and Clausius' statement of Second law of thermodynamics, reversibility and irreversibility, Heat pump and Refrigerators, Carnot cycle, Reversed Heat engine Carnot's theorem, concept of entropy and exergy

Unit –IV Properties of Pure Substance

p-v diagram for pure substance, p-T diagram for pure substance, T-s diagram for pure substance, h-s diagram for pure substance, steam quality

Unit –V Thermodynamic Cycles

Rankine cycle, air-standard Otto cycle, air-standard Diesel cycle, Vapor-compression refrigeration cycle, Vapour absorption cycle.

Textbook

- Engineering Thermodynamics- P.K. Nag – 6th Ed., McGraw–Hill
- Thermodynamics: An Engineering Approach, Michael Boles, Yunus Cengel and Mehmet Kanoglu, 9th Edition, McGraw-Hill Higher Education

Reference book

- Fundamentals of Thermodynamics – Claus Borgnakke, Richard E. Sontag, 7th Ed., John Wiley and Sons

Course: Basics of Electrical and Electronics Engineering
Course Code: 24UELE12
Category: DMC

Credit	Hours	Marks		
3	45	I	E	TO
		15	35	50

Course Objective

The primary objective of the course Basics of Electrical and Electronics Engineering is to provide students with a foundational understanding of electrical and electronic principles, components, and systems. This course aims to equip students with the essential theoretical knowledge and practical skills needed to effectively work in various technical and engineering fields.

Expected Learning Outcome

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

1. Understand and analyse electrical symbols, sources, Ohm's Law, Kirchhoff's Laws, and resistor configurations in DC circuits.
2. Develop competence in analyzing AC circuits sinusoidal waveforms, AC values and connections.
3. Acquire knowledge of the principles, operation, and performance characteristics of electrical machines, including transformers, DC machines, and AC machines.
4. Understand the operation and application of protective devices and implement essential safety precautions in electrical systems.
5. Gain an understanding of semiconductor devices, their characteristics, and their applications in electronic circuits.

Unit I Electrical Components and DC Circuits

Electrical Symbols of electrical components, voltage and current source, independent and dependent sources, ideal voltage source, ideal current source, practical sources, Conversion of Current and Voltage Source, Ohm's law, Kirchhoff's Law, Resistance in Series, Resistance in Parallel Circuit

Unit II AC Circuits

AC current and voltage, Difference between AC and DC, Generation of alternating voltage and current, Difference between single phase and three phase supply, Average value and RMS value of sinusoidal current and voltage, Form Factor, Peak factor, Phase angle, Star connection, Delta Connection, Conversion from star to delta connection and vice versa.

Unit III Electrical Machines

DC Generator: Construction, Principle of Operation, EMF equation, Equivalent Circuit, Concept of Commutation, Applications. DC Motor: Construction and Principle of Operation, Back EMF, Equivalent Circuit, Applications, Three-phase Induction Motor: Construction and Principle of Operation, Speed and Slip, Applications, Transformer: Working principle of transformer, construction and EMF equation.

Unit IV Protective Devices & Safety Precautions

Protective Devices: Fuses, MCB, ELCB, Purpose of Earthing, Safety Precautions: Personal Protective Equipment, Electric Shock, Electric Shock treatment, Electrical Safety Measures, Precautions against electric shock, Electrical fire safety: Causes and Prevention.

Unit V Semiconductor Devices & its Applications

Concept of semiconductors, Types of Semiconductors – P and N type, Intrinsic and Extrinsic semiconductors, PN junction, Diode: working and V-I characteristics, Half-wave rectifier, Zener diode: Working, Characteristics, Applications.

Text Books

- Fundamentals of Electrical Engineering and Electronics by S.K. Sahdev, Dhanpat Rai & Co., 2018.
- A Text Book of Electrical Technology (Volume-I) by B.L. Theraja and A.K. Theraja, S.Chand Publications, 2018.

Reference Books

- A Course in Electrical Technology by J.B Gupta, Katson Publications, 2013.
- Electrical Technology by J.S Katre, Techmax Publications, 2016.
- Basic Electrical Engineering by D.C. Kulshreshtha, McGrawHill, 2nd Edition, 2022
- Electrical Engineering Fundamentals by V.D. Toro, Pearson, 2nd Edition, 2021

Course: Basic Electrical and Electronics Engineering Lab
Course Code: 24UBEE13
Category: DMC

Credit	Hours	Marks		
1	30	I	E	TO
		35	15	50

List of Experiments

1. To identify and classify various tools, symbols and abbreviations
2. To verify Ohm's law
3. To verify Kirchoff's Current law
4. To verify Kirchoff's Voltage law
5. To study and differentiate waveforms of AC and DC power supply
6. To construct and study working of star-delta starter
7. To study and perform speed control of DC motor
8. To study and perform speed control of Single phase induction motor
9. To perform open circuit test and short circuit test of a single-phase transformer
10. To identify and classify different personal protective equipment
11. To identify and classify various electrical protective devices
12. To draw V I characteristics of pn junction diode
13. To draw V-I characteristics of zener diode

Note: Minimum 8 experiments to be performed

SUBJECT: Fundamental of Solar Panel
CODE: 24USPV02
CATEGORY: DMC

Credit	Hours	Marks		
3	45	I	E	TO
		15	35	50

Course objective:

This course deals with the fundamentals of solar energy, solar cell and their characteristic, Solar Photovoltaic Module Array, Manufacturing and Fabrication of solar Module, Economic and Environmental Analysis of PV Systems.

Expected Learning Outcomes

After successful completion of this course the students will be able to:

1. Understand: overview of global and Indian energy scenario, propagation of solar radiation from the sun to earth
2. Understand Solar Cell and its function, Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell.
3. Understand solar panel construction, solar panel array configurations, blocking diode and bypass diode Connection of PV Module in Series and Parallel.
4. Understand Types of Solar cells, Manufacturing of solar cells, Fabrication of solar
5. Understand cost components of PV systems, Payback period and return on investment

Sr.no	Unit name	Syllabus
1	Introduction of solar PV system	Introduction to solar energy: overview of global and Indian energy scenario, need of solar energy, propagation of solar radiation from the sun to earth; solar radiation geometry: sun earth geometry, Solar Forecasting and its role
2.	Solar Photovoltaic	Solar Cell and its function, Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell, Solar PV Module, Rating of Solar PV Module, PV Module Parameters, Efficiency of PV Module, Measuring Module Parameters.
3.	Solar Photovoltaic Module Array	solar panel construction, solar panel array configurations, blocking diode and bypass diode Connection of PV Module in Series and Parallel, Estimation and Measurement of PV Module Power. Selection of PV Module.
4.	Manufacturing and Fabrication of solar Module	Types of Solar cells, Manufacturing of solar cells, Fabrication of solar
5.	Economic and Environmental Analysis of PV Systems	• Cost components of PV systems • Payback period and return on investment (ROI) • Life cycle cost analysis • Environmental benefits and challenges • Lifecycle assessment of PV systems • Case studies of successful PV projects

Suggested ReadingsText Book

R. Messenger, J. Ventre, Photovoltaic Systems Engineering, 2nd ed., CRC Press, 2004.

Reference Book

• L. Castaner, S. Silvestre, Modelling Photovoltaic Systems Using PSpice, John Wiley & Sons, 2002.
• R. J. Komp, Practical photovoltaics: electricity from solar cells, 3rd ed., Aatec Publications, 2001

SUBJECT: Fundamental of Solar Panel Lab
CODE: 24USPV03
CATEGORY: DMC

Credit	Hours	Marks		
1	30	I	E	TO
		35	15	50

Course objective:

This course deals with the fundamentals of solar energy, solar cell and their characteristic, Solar Photovoltaic Module Array, Manufacturing and Fabrication of solar Module, Economic and Environmental Analysis of PV Systems.

Expected Learning Outcomes

After successful completion of this course the students will be able to:

1. Understand: overview of global and Indian energy scenario, propagation of solar radiation from the sun to earth
2. Understand Solar Cell and its function, Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell.
3. Understand solar panel construction, solar panel array configurations, blocking diode and bypass diode Connection of PV Module in Series and Parallel.
4. Understand Types of Solar cells, Manufacturing of solar cells, Fabrication of solar
5. Understand cost components of PV systems, Payback period and return on investment

Sr no	List of practical's
1.	To study the impact of solar intensity on PV performance
2.	To study the role of the orientation of PV module on its performance
3.	To study the I-V characteristic of the PV module
4.	To study the temperature's impact on PV current, voltage and power.
5.	To Study the series and parallel connection of PV module
6.	To study the CO_2 reduction by panel over it's lifespan
7.	To study the economic features of the PV module
8.	To study and draw the production line of PV module
9.	A project report on the plant visit of the PV module manufacturing

Course Title	Mathematics – I	Course Code	24UMTH01		
Specialization	Multidisciplinary	Structure (LTP)	2	1	0
Offered for	B.Voc.	Status	Core √	Elective	
Faculty	SFASH	Type	New √	Modification	
Credits	3	Marks	Internal	30	
Hours	45		External	70	
Pre-requisite	Nil	To take effect from	2024-2025		
Submission date	12-07-2024	Date of approval by BoS	23-07-2024		

Course Objective	This introductory course emphasizes a strong understanding of fundamental concepts. By focusing on single-variable and multi-variable calculus, this foundation course serves as a critical building block for various disciplines such as science, engineering, economics etc.
Course Outcome	On completion of this course, students will be able to: CO1: To trace, identify, practice and develop the significant Indian Mathematics knowledge. CO2: To acquire basic knowledge in Complex number system CO3: Apply differential and integral calculus to notions of curvature and to improper integrals. Interpret relations among sets using Venn diagrams CO4: Explain the fallout of the Rolle's and Mean Value Theorem that are fundamental to the applications of analysis to engineering problems CO5: To deal with functions of several variables and their applications in evaluating multiple integrals and their usage.
Contents of the course	Unit 1: **Indian Knowledge System:** Introduction of inception of Mathematics from vedic periods. Details of different authors who has given mathematical & astronomical sutra (e.g. Arytabhatta, Bhaskara, Brahmagupta, Varamahira, Budhyana, Panini, Pingala) Unit 2: De Moivre's theorem and roots of complex numbers, Euler's theorem, Logarithmic Functions Unit 3: Curvature, Evaluation of definite and improper integrals; Applications of definite integrals to evaluate surface areas and volumes of revolutions Unit 4: Rolle's Theorem, Mean value theorems and applications, Taylor and Maclaurin series, Indeterminate forms and L' Hopital's rule

	Unit 5: Limit, continuity and partial derivatives, directional derivatives, total derivative, Gradient, Divergence and Curl, Double integrals (Cartesian), change of order of integration in double integrals, Triple integrals (Cartesian), Applications: areas and volumes
Text Books	• B.S Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010. • Reena Garg, Engineering Mathematics - I, Khanna Book Publishing Company, 2020. • H K Dass, Advanced Engineering Mathematics, S Chand Publication • Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
References	1. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. 3. Edwards, Henry C., and David E. Penney. Multivariable Calculus. 6th ed. Lebanon, IN: Prentice Hall, 2002. 4. Simmons, George F. Calculus with Analytic Geometry. 2nd ed. New York, NY: McGraw-Hill, October 1, 1996.

(U Gradation) For B. Voc/B. Com/BBA/B.Sc.

Course Title – Yoga and Health Skills –II

Course Credit: 02 (L02-T0-P0)

Course code: 24UYHS01
Max. Marks: 100(30I+70E)

Objective: Students will get information about the origin, history and development of Yoga along with different streams of yoga, literature and meditation.

Learning Outcome: After the completion of the course, the learners will be able to

1. To make aware of the definition, history and nature of yoga.
2. Telling information about different school of yoga.
3. Giving information about cleansing technique and yogic diet.
4. Explaining the importance of health.
5. Yogic management of various diseases and the utility of meditation.

Unit	Statement
1	**Introduction to Yoga:** Meaning and Definition of Yoga, Aim and Objectives of Yoga, Misconceptions of Yoga; Brief knowledge about Streams of Yoga-Ashtang and HathaYoga. Yogic Prayer, Mant... Importance of Yoga in modern era.
2	**Yoga practices:** Raja Yoga (AshtangaYoga), GyanYoga, Bhakti Yoga, Karma Yoga, Hatha Yo...
3	**Introduction to cleansing technique:** Meaning, Definition, Objectives and Classification... Diet, Yogic Diet, Anti-diet, Balanced diet
4	**Health:** Meaning, Definition, aim and objectives, Dincharya (Daily regimen): Meaning, definition and sequential elements, Application of Dincharya, Ritucharya (Seasonal Regimen): Meaning, Definition, Types with their salient features, Season wise Does and Don'ts
5	**Yogic management in health problems:** cervical, back pain, diabetes and stress. **Meditation:** Meaning, types, importance, general instructions and suggestions for medi ation pr... mental and spiritual effects of meditation.

TEXT BOOKS

1. Yoga & yogic chikitsa - Singh Prof. Ramharsh .Chaukhamba Sanskrit pratishthan, Edition 2011
2. Swami Vivekananda: Jnana Yoga, Bhakti Yoga, Karma Yoga, Raja Yoga, Advaita Ashrama, Calcutta, 2002.
3. Prof. Ramharsh Singh -SwashthavrittaVigyan, Chaukhambha Sanskrit Prakashan, Varanasi, 1998.
4. Sriram Sharma Acharya- JivemSharadahShatam, AkhandJyoti Mathura 1998.
5. Prof. Ramharsh Singh-Yogewam Yogic Chitksha, Chaukhambha Sanskrit Prakashan, ... 1998
6. SwasthaVrittaVigyanewam Yogic Chikitsha- Dr. RakeshGiri, SikhshaBharti, Uttrakhand.

References Books

1. Swami Kuvalyananda : Asana, Kaivalyadhama, Lonavla, 1993
2. Swami Satyananda Saraswati: Asana, Pranayama, Bandha, Mudra, Bihar School of Yoga, Munger, 2009
3. Basavaraddi, I.V. & others: YOGASANA: A Comprehensive description about Yogasana, MDNIY, New Delhi, 2011.
4. Basavaraddi, I.V. & others: Yogic Sukshma Evam Sthula Vyayama, MDNIY, New Delhi, 2011.

English Language and Business Communication

Course Code: 24UENG01

Course Credit: 01(1-0-0)
Max. Marks: 50 (15I+35E)

Objective:

To train students to enhance their skills in written as well as oral communication through practical conduct of this course. This course will help students in understanding the principles and techniques ofbusiness communication.

Learning Outcomes: After completing this course, the learns will be able to

1. Students would be able to understand the nature, structure, types and process of various dimensions of communication and apply them in communication.
2. Students would be able to make effective presentations in various business/professional situations incorporating the ethics of good negotiations and assertive behavior.
3. Students would develop competency to understand and perform the diversity of the globalized multicultural world.
4. Students would be able to draft various types of documents used inside the organization for various types of communication.
5. Students would develop interview skills and competency incorporating the use of different social media platforms for networking.

Units	Topics
I Basics of Communication	Meaning, Process and Types of Communication; Principles of Effective Communication; Process and types of listening, deterrents to listening process, essentials of good listening.
II Presentation Skills	Prerequisites of effective presentation, format of Presentation. Negotiations-types, structures and basics of negotiations; Assertive behavior.
III Multicultural World and Communication	Business Communication in a globalized and multicultural world; understanding cultural diversity and developing cultural competency and inter-cultural business communication skills; Barriers to cross-cultural communication and strategies to overcome them.
IV Written Communication	Mechanics of writing, report writing, agenda and minutes; business correspondence – business letter format, style of letter arrangement, types of letters, electronic mail; Resume Writing
V Communication in Practice	Preparing for interviews- types of interviews, process of interview and group discussion; effective ways of performing well in interviews; Social media and Networking, Social media profiles, Editing and Posting onsocial media;

Recommended Readings:

- Bovee, C., & Thill, J.V., and Raina, R.L. *Business Communication Today*. New York: Pearson, 2016.
- Lata, Pushp, and Sanjay Kumar. *Communication Skills*. 2nd ed. New Delhi: OUP, 2019.
- Lehman, C. M., Dufrene D. D., and Sinha, M. *BCOM: The South Asian Perspective on Business Communication*. New Delhi: Cengage Learning, 2016.
- Monippally, Matthukutty, M. *Business Communication: From Principles to Practice*. New Delhi: McGraw Hill Pub., 2018.
- Mukerjee, H. S. *Business Communication: Connecting at Workplace*. New-Delhi: Oxford University Press, 2012.
- Murphy, H. A., Hildebrandt, H.W., and Thomas, J.P. *Effective Business Communication*. Boston: McGraw-Hill Companies, 1997.
- Post, Emily. *The Etiquette Advantage in Business*. New York: Collins, 2005.
- Ramesh, Gopalaswamy, and Mahadevan Ramesh. *The Ace of Soft Skills: Attitude, Communication and Etiquette for Success*. Noida: Pearson, 2019.
- Sandra, M. O. *Handbook of Corporate Communication and Strategic Public Relations: Pure and Applied*. New Delhi: Routledge, 2004.
- Sinha, K. K. *Taxmann's Business Communication*.4th Revised ed. New Delhi: Taxmann's Pub., 2018.
- Taylor, Grant. *English Conversation Practice*. Indian ed. Chennai: McGraw Hill Education Pvt. Ltd., 2017.

English Language and Business Communication Practical

Course Code: 24UENG02

Course Credit: 01(0-1-0)
Max. Marks: 50(35I+15E)

Objective: This course is designed to strengthen the communication abilities of the learners by providing them hands-on practice.

Learning Outcomes: After completing this course, the learns will be able to

1) Demonstrate knowledge and understanding of a range of professional or public communication situations.
2) Perform effectively in diverse professional and public communication situations like interviews and negotiations, drafting emails and resume etc.

Details

1) Situational Conversations
2) Listening Skills
3) Resume Writing
4) Mock Interviews
5) Group Discussion
6) Presentation Skills
7) Negotiation Skills
8) Email Writing
9) Public Speaking
10) Extempore Speech

Note: The teacher should play the role of the facilitator and allow the learners maximum time to practice these activities. The focus should be primarily on helping the learners overcome the LSWR barrier and gradually move towards honing these skills to enable the learners use them in professional communication situations.

SUBJECT: Engineering Graphics and Drawing Lab
CODE: 24USGD04
CATEGORY: DMC

Credit	Hours	Marks		
2	60	I	E	TO
		70	30	100

Course Objectives

- To understand and appreciate the importance of Engineering Graphics in Engineering
- To understand the basic principles of Technical/Engineering Drawing
- To understand the different steps in producing drawings according to BIS conventions
- To develop skills to visualize actual object or a part of it based on drawings.

Expected Learning Outcomes

Upon successful completion of this course, students will be able to:

- Identify the different views of designed components.
- Develop drafting and sketching skills & application of drawing equipment's.
- Read various engineering curves, projections and dimensioning styles.
- Develop skills to translate ideas into sketches and draw.
- Develop skills to visualize actual object or a part of it, based on drawings.

Unit 1 Introduction to drawing,

Lines and lettering: Definition and classification of drawing, drawing instruments such as: drawing board, drawing sheets, drafter. Types of pencils, sheets, eraser etc. Different types of lines (Straight line, inclined line and curved lines) Practice engineering style for letters and numbers as BIS: SP:46-2003. Hands on training: - Prepare drawing sheet by using different types of lines, Prepare Drawing Sheet Using Alphabets. Prepare drawing sheet by Bisection of line, angle, arc.

Unit 2 Dimensioning and scale

Importance of dimensioning, Types (i.e. chain, parallel and progressive etc.) and methods of placing dimensioning (i.e. aligned and unidirectional), Principles of dimensioning and practice dimensioning technique as BIS: SP: 46-2003. Free hand sketching of straight lines, circle, square, Polygons. Hands on training: - To divide line of length 120mm into 9equal parts, divide a circle into 12 equal parts by using engineering compass, Prepare drawing sheet by free hand sketching.

Unit 3 Introduction to Projection

Introduction to first and third angle projection, Introduction to projection of point, line and plane. Sectioning of solids. Hands on training: - Practice for projection of point, Practice for projection of line. Practice for projection plane, Practice for sectioning of different solids.

Unit 4 Isometric and Orthographic projection

Isometric drawing of simple geometric solids, Orthographic projection of simple geometric solids. Hands on training: - Prepare drawing sheet of orthographic projection, Prepare drawing sheet of isometric projection. Orthographic drawings of Bolts and Nuts, Bolted Joints, Screw threads, Screwed Joints.

Unit 5 Geometric and dimensioning Tolerance

Component Drawing and interpretation, Geometric dimension and Tolerance, Introduction to software used in drawing, Hands on training: - Prepare drawing sheets by using GD&T in drawing.

Text Book

Engineering Drawing Plane and Solid Geometry : N.D. Bhatt and V.M. Panchal, Forty- Fourth Edition 2002, Charotar Publishing House.

Reference Book

Engineering Graphics and Drafting: P.S. Gill, Milenium Edition, S.K. Kataria & Sons.

SEMESTER -II																	
Course Code	Course Name	Credits				Hrs				Marks							
										Theory(T)			Practical(P)			Total	
		L	T	P	TO	L	T	P	TO	I	E	TO	I	E	TO	(T+P)	
24USHT05	Heat Transfer (DMC)	3	0	0	3	45	0	0	45	30	70	100	0	0	0	100	
24UELE14	Power Electronics (DMC)	3	0	0	3	45	0	0	45	15	35	50	0	0	0	50	
24USPI06	Solar Panel Installation (SEC)	4	0	0	4	60	0	0	60	15	35	50	0	0	0	50	
24USIM08	Industrial Management (DMC)	3	0	0	3	45	0	0	45	30	70	100	0	0	0	100	
24UPHY01	Applied Physics (MDC)	2	0	0	2	30	0	0	30	15	35	50	0	0	0	100	
24UPHY02	Applied Physics Lab (MDC)	0	0	1	1	0	0	30	30	0	0	0	35	15	50	50	
24UCAD09	CAD (DMC)	0	0	1	1	0	0	30	30	0	0	0	35	15	50	50	
24UELE15	Power Electronics Lab (DMC)	0	0	1	1	0	0	30	30	0	0	0	35	15	50	50	
24USOI07L	Solar Panel Installation Lab (SEC)	0	0	2	2	0	0	60	60	0	0	0	35	15	50	50	
	Total	15	0	5	20	225	0	150	375	105	245	350	140	60	200	600	

Chairperson
SDGT, SFET
SVSU

Dean Engineering
Shri Vishwakarma Skill University

SUBJECT: Heat Transfer
CODE: 24USHT05
CATEGORY: DMC

Credit	Hours	Marks		
3	45	I	E	TO
		30	70	100

Course Objectives

This course is designed to introduce a basic study of the phenomena of heat transfer, to develop methodologies for solving a wide variety of practical engineering problems and to design thermal systems by applying the principles of heat transfer.

Learning Outcomes

Upon successful completion of this course, the student will be able to:

- Understand the basic laws of heat transfer
- Analyze problems involving steady-state heat conduction in simple geometries
- Understand the principles of convection and evaluate convective heat transfer coefficients in forced and natural convection over exterior surfaces
- Understand different laws related to thermal radiation and calculate radiation heat exchange between black and gray body surfaces.
- Analyze heat exchanger performance by using the method of log mean temperature difference.

Unit-I Introduction

Basics and Laws: Definition of Heat Transfer, Reversible and irreversible processes, Modes of heat transfer, Steady State Heat Conduction.

Unit-II Conduction

Introduction, I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere, Conduction equation in Cartesian, polar and spherical co-ordinate systems. Steady State Conduction with Heat Generation: Introduction, 1 – D heat conduction with heat sources.

Unit-III Convection

Convection: Forced Convection-Thermal and hydro-dynamic boundary layers, Laminar and turbulent flows, Empirical relations for forced convection over a horizontal plate

Free convection from a vertical flat plate, Empirical relations for free convection from vertical and horizontal plates,

Unit-IV Radiation

Thermal Radiation: The Stephen-Boltzmann law, The black body radiation, Shape factors and their relationships, Heat exchange between black and non-black bodies, and Radiation shields.

Unit-V Heat Exchanger

Heat Exchangers: Classification, Analysis of a parallel/counter flow heat exchanger, Log mean temperature difference, Heat exchangereffectiveness

Textbooks

- Heat Transfer by J P Holman, 9thEdition, McGraw Hill Education, 2009.
- Heat Transfer' by SP Sukhatme. RB4: 'Heat and Mass Transfer' Data Book by CP Kothandaraman.

Reference Books

Heat and Mass Transfer by Yunus A. Cengel & Afshin J. Ghajar, 5th Edition, McGraw Hill Education, 2016.
Fundamentals of Heat and Mass Transfer by Frank P. Incropera & David P. Dewitt, 7thEdition, John Wiley, 2008

Course: Power Electronics
Course Code: 24UELE14
Category: DMC

Credit	Hours	Marks		
3	45	I	E	TO
		15	35	50

Course Objective

The primary objective of the course Power Electronics is to understand basic power electronic devices, their role in power conversion and study basic topologies of various converters.

Expected Learning Outcomes

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

1. Understand the concept of power electronics and its applications.
2. Understand the principles, characteristics, and applications of power semiconductor diodes and thyristors in electronic and power circuits.
3. Acquire knowledge of the operation, analysis, and applications of phase-controlled rectifiers in power conversion systems.
4. Understand the operation, design and application of choppers and inverters in DC and AC power conversion systems.
5. Acquire knowledge about the principle of operation and applications of AC voltage controllers and cycloconverters in power electronic systems.

Unit I Introduction

Concept of Power Electronics, Applications of Power Electronics, Advantages and Disadvantages of Power Electronic Converters, Power Electronic Systems, Power Semiconductor Devices, Types of Power Electronic Converters.

Unit II Power Semiconductor Diodes and thyristors

Characteristics of Power Diodes: V-I characteristics and diode reverse recovery characteristics, Types of Power Diodes, Static V-I characteristics of thyristor, thyristor turn-on methods.

Unit III Phase Controlled Rectifiers

Principle of phase control, Single phase half-wave circuit with R load, single-phase full wave mid-point converter

Unit IV Choppers and Inverters

Principle of chopper operation, Control strategies, step-up and step-down chopper, Single-phase Voltage Source Inverter, Single-phase current source inverter with ideal switches.

Unit VAC voltage controllers and Cycloconverters

Types of AC voltage controllers, Integral cycle control, single-phase voltage controller with R load, Single-phase to Single-phase step-up mid-point cycloconverter, Single-phase to Single-phase step-up bridge type cycloconverter

Text Books

- P. S. Bimbhra, "Power Electronics", Khanna Publishers, New Delhi.
- Ned Mohan, Tore M. Undeland, 'Power electronics: converters, applications, and design', John Wiley & Sons., 3rd Edition.
- M.D. Singh, K.B. Khanchandani, 'Power Electronics', second edition, TATA McGraw Hill.

Reference Books

- Muhammad H. Rashid, "Power Electronics - circuits, devices and applications", Prentice Hall of India, 2nd edition.
- Power Electronics – Devices, Converters and Applications", by Vedam Subramanyam Revised 2nd edition, New Age Publications.
- Thyristorised Controller by Dubey, Joshi & Doradla, New age Publication

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Dean Engineering Shri Vishwakarma Skill University

Course: Power Electronics Lab
Course Code: 4UELE15
Category: DMC

Credit	Hours	Marks		
1	30	I	E	TO
		35	15	50

List of Experiments

1. To identify and classify various power electronic components.
2. To simulate and draw the V-I characteristics of thyristor using MATLAB/Simulink.
3. To study the operation of single phase fully controlled phase control rectifier with resistive load.
4. To study and analyse single phase fully controlled AC power controlled under different loading conditions.
5. To study and analyse single phase single pulse PWM inverter
6. To simulate and analyse performance of Single-phase half-wave circuit with R load using MATLAB/Simulink.
7. To simulate and study performance of step-up chopper with resistive load using MATLAB/Simulink.
8. To simulate and study performance of Single-phase to Single-phase step-up mid-point cycloconverter using MATLAB/Simulink.
9. To simulate and study performance of Single-phase to Single-phase step-up bridge cycloconverter using MATLAB/Simulink.
10. To simulate and study performance of Single-phase Voltage Source Inverter using MATLAB/Simulink.

Note: Minimum 8 experiments to be perform

Dean Engineering
Shri Vishwakarma Skill University

SUBJECT: Solar Panel Installation
CODE: 24USPI06
CATEGORY: SEC

Credit	Hours	Marks		
4	60	I	E	TO
		15	35	50

Course objective:

This course deals with the role of Technician in solar panel installation including Measuring instruments, tools and materials, Components for Solar PV System, Solar site analysis, Installation and maintenance and related health and safety Practices, Work Ethics and Workplace Safety.

Expected Learning Outcomes

After successful completion of this course the students will be able to:

1. Understand type of hand tools, power tools, measuring tools, wiring and other materials used in installation.
2. Understand solar PV modules, batteries, charge controllers, inverters and mounting structures.
3. Understand Prerequisite for solar panel installation, site selection, customer requirements, mounting structures
4. Understand installation, assemble and fix mounting structure, connection of the system, troubleshooting.
5. Understand workplace hazards, fire safety, first aid, Work Ethics and Workplace Safety,

Sr no	Unit name	Contents
1.	**Measuring instruments, tools and materials**	• Type of Hand tools, it's uses and precautions • Type of Power tools, it's uses and precautions • Type of Measuring instruments, its's use and precautions • Wiring and other material
2.	**Components for Solar PV System**	• Solar PV Modules • Batteries in a PV System • Charge Controllers • Inverters • Mounting Structures
3.	**Solar site analysis**	• Prerequisite for solar panel installation • Site selection for solar panel installation • Customer requirements • Mounting structure
4.	**Installation and maintenance**	• Type of solar PV plant • Assemble and fix the mounting structure • Connection between components of solar panel installation • Troubleshooting of the solar system
5..	**Health, Safety &work ethics**	• Workplace Hazards • Fire Safety • First Aid • Waste Management • Work ethics • Workplace safety

Textbook

- Participant handbook solar panel installation technician – ESSI Sector, Ref Id- ELE/Q5901, version 2.0, NSQF level -4
- Basic of Electrical and Electronics Engineering by S.k Sahdev, Dhanpatrai Publications, 2013

Reference book

- Non-conventional energy source by G.D.Rai

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SUBJECT: Solar Panel Installation Lab
CODE: 24USOI07L
CATEGORY: SEC

Credit	Hours	Marks		
2	60	I	E	TO
		35	15	50

Course objective:

This course deals with the role of Technician in solar panel installation including Measuring instruments, tools and materials, Components for Solar PV System, Solar site analysis, Installation and maintenance and related health and safety Practices, Work Ethics and Workplace Safety.

Expected Learning Outcomes

After successful completion of this course the students will be able to:

1. Understand type of hand tools, power tools, measuring tools, wiring and other materials used in installation.
2. Understand solar PV modules, batteries, charge controllers, inverters and mounting structures.
3. Understand Prerequisite for solar panel installation, site selection, customer requirements, mounting structures
4. Understand installation, assemble and fix mounting structure, connection of the system, troubleshooting.
5. Understand workplace hazards, fire safety, first aid, Work Ethics and Workplace Safety,

List of experiment:

Sr.no	List of Experiments
1.	Role play for Analyse the customer's solar installation requirements
2.	To analyse prerequisites for installing a solar PV system
3.	To analyse the location for solar panel installation
4.	To Assemble and fix the mounting structure
5.	To perform setting up connection between different components of the PV system
6.	To Perform troubleshooting of PV system
7.	To perform battery installation and maintenance.
8.	Use of hand tools, power tools and measuring tools.
9.	Use and perform health and safety equipment's
10	Role play for Interaction with supervisor and colleagues
11.	Recognize the potential sources of accidents and safety measures.
12.	Role plays How to manage a conflict.

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Dean Engineering
Shri Vishwakarma Skill University

SUBJECT: Industrial Management
CODE: 24USIM08
CATEGORY: DMC

Credit	Hours	Marks		
3	45	I	E	TO
		30	70	100

Course Objective

To equip students with the knowledge and skills to optimize production processes, manage operations efficiently, and improve organizational performance. It aims to develop an understanding of strategic planning, resource allocation, and quality control. Students will learn to apply management principles and techniques to enhance productivity and competitiveness in industrial settings.

Expected Learning outcome

1. **Operational Efficiency**: Students will be able to apply techniques to optimize production processes, reduce waste, and improve overall operational efficiency.
2. **Strategic Planning**: Students will develop skills in strategic planning and decision-making to enhance organizational performance and competitiveness.
3. **Resource Management**: Students will learn to effectively manage resources, including human, financial, and material, to achieve organizational goals.
4. **Quality Control**: Students will gain an understanding of quality control principles and methods to ensure product and service excellence.
5. **Problem-Solving**: Students will be able to identify, analyze, and solve complex industrial management problems using appropriate tools and methodologies.

Unit I Private sector and Public sector
Public sector enterprise, merits and demerits of public sector industry and private sector industry, Line, staff and functional organizations, reasons for the choice of various types of organization, functions of different departments, viz. stores, purchase and sales departments relationship between individual departments.

Unit 2 Labour, industrial & tax laws:
Evolution of industrial law, factory act, workmen compensation act, payment of wages act, employee's state insurance act, Industrial dispute act. Role of technician in industry: Position of technician in various engineering departments, Role of a supervisor in industry, Foremanship, duties and qualities of a good foreman.

Unit 3 Introduction, Basic concepts of total quality management
Introduction to Quality, Dimensions of Quality, Quality Planning, Concept and definition of quality cost, Determinants of Quality, Optimum cost of performance, Principles of TQM, Pillars of TQM, Introduction to leadership and Leadership roles, Quality council and Quality statement, Strategic Planning Process, Deming philosophy

Unit 4 Continuous process improvement
Input /output process Model, Juran trilogy, PDCA Cycle, 5 –'S' Housekeeping principle, Kaizen Seven tools of Quality (Q-7 tools), Check Sheet, Histogram, Cause and effect diagram, Pereto diagram, Stratification analysis, Scatter diagram, Control charts, Control chart for variables & process capability, Control chart for attributes

Unit 5. Total productive maintenance (TPM)
Concept of Total Productive Maintenance, Types of maintenance, OEE (Overall Equipment Efficiency), Stages in TPM implementation, Pillars of TPM, Difficulties faced in TPM implementation. Just in time (JIT) JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban & 2 Bin Systems.

Text Book
Total quality Management by Poornima M Charantimath, Pearson Publication.

Reference Book
Total Quality Management, S.C. Sharma, T.R. Banga, Khanna Publishing House

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APPLIED PHYSICS

B.Voc. (Common for all Branches)

L	T	P	Credits	Core Course	Internal Examination	:	15
2	0	0	2	24UPHY01	External Examination	:	35
				2024-25	Total	:	50
Effective from Session:				23-07-2024	Duration of Exam	:	3 Hrs
Date of BoS approval:							
Prerequisite							

Instruction for Paper Setter:

1. There should be 11 questions in the End Term examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 10 marks
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 5 units as per the syllabus. Every unitshall have two questions each of 5 marks each. However, the student shall be asked to attempt only one of the twoquestions in the unit. Individual questions may contain sub-parts / sub-questions.
4. Each Unit shall have a marks weightage of 8.
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required

Objectives

The aim of this subject is to provide the students with the basic concepts of measurement, properties of fluid, laser and fibre optics, Nanoscience etc.

Course Outcomes:

After completing this subject, student should be able to:

CO1. Learn about Indian knowledge system.
CO2. Understand about properties of matter and thermal physics with examples.
CO3. To explain the fundamentals of LASER and its applications.
CO4. To learn the basics of fibre optics and their applications.
CO5. To explain fundamentals of photo conductivity, Nanoscience along with their practical applications

UNIT I:

Indian Knowledge System

Physics in Vedas, Atomic theory from Bhagavad-Gita, Indian invention of atomic theory, History of Electricity: From Ancient times to the Modern times, Maharishi Augustaya, History of light, Sound in Vedic Science, Indian Scientist in Physics: Acharya Kanada (Laws of motion), Aryabhatta, Sir C. V. Raman, Satyendra Nath Bose, Homi Jahangir Bhabha, Subrahmanyan Chandrasekhar, Vikram Ambalal Sarabhai.

Unit-II

Properties of Matter and Thermal Physics: Definition and types of stress and strain, Hooke's law, Fluid properties – density, Specific weight, Specific gravity, Surface tension, Viscosity, Pressure – atmospheric pressure, gauge pressure, absolute pressure, Pascal's law, buoyancy, Introduction to laminar and turbulent flow. Modes of heat transfer- thermal conductivity.

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UNIT III

Quantum Physics: Inadequacy of classical physics, need for quantum physics, Historical overview, Plank's hypothesis, Quantization of energy, Origin of quantum theory, Photoelectric effect, de Broglie hypothesis – matter waves, Wave-particle duality, Wave-packets, Phase velocity and Group velocity, Experimental evidence of de Broglie's hypothesis: Davisson–Germer experiment, Heisenberg uncertainty principle.

Unit-IV

Electromagnetic Theory: Faraday's law, Lenz's law, Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields, energy stored in a magnetic field, displacement current and magnetic field arising from time-dependent electric field, Maxwell's equation in vacuum and non-conducting medium.

Unit V: Nanoscience and technology

Nanomaterials, types of nanomaterials, properties of nanomaterials, Density of states (0 dimensional, 1-dimensional, 2-dimensional, 3-dimensional), Top-down and bottom up approaches, Characterization of nanomaterials (Scanning Electron microscopes and Transmission electron microscopes).

Textbook

1. David Griffiths, Introduction to Electrodynamics
2. Nouredine Zettili, Quantum Mechanics: Concepts and Application
3. A. Ghatak, Optics, 7th Edition, McGraw Hill Education (India) Pvt Ltd.
4. O. Svelto, Principles of Lasers, 5th Edition, Springer.
5. Shotwell, K. Thyagarajan, Introduction to Fiber Optics, 1st Edition, Pearson Education India
6. Avadhanulu M. N. and P G Kshirsagar, A Text Book of Engineering Physics, 7th Edition, S. Chand
7. H K Malik and A K Singh, Engineering Physics, 2nd Edition, McGraw Hill Education (India) Pvt Ltd.

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Applied Physics Lab							
B.Voc. (Common for all Branches)							
L	T	P	Credits	Core Course	Internal Examination	:	35
0	0	2	1	24UPHY02	External Examination	:	15
Effective from Session:				2024-025	Total	:	50
Date of BoS approval:				23-07-2024	Duration of Exam	:	3 Hrs

Objectives:

Students will be able to learn how physics and other disciplines have impacted and continue to impact each other and society.

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

1. Able to perform experiments of screw jack and worm and worm wheel.
2. Able to determine force constant using Hooke's law
3. Able to perform Bernoulli's theorem.

List of Practical's

1. To determine force constant of spring using Hooke's law
2. To determine the Moment of Inertia using a Flywheel.
3. To verify the Bernoulli's Theorem.
4. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee'sapparatus.
5. To study the characteristics of Cu-Fe thermo couple.
6. To find the value of Planck's constant by using a photo electric cell.
7. To determine the energy gap of a semiconductor diode.
8. Solar Cell: To study the V-I Characteristics of solar cell.
9. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
10. Photoelectric effect: To determine work function of a given material.
11. LASER: To study the characteristics of LASER sources.
12. Optical fibre: To determine the bending losses of Optical fibres.

Note- Experiment may be added as per the curriculum and ability.

Note: Minimum 8 Experiments to be performed

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SUBJECT: CAD LAB
CODE: 24UCAD09
CATEGORY: DMC

Credit	Hours	Marks		
1	30	I	E	TO
		35	15	50

Course objectives:

- To understand the fundamentals and use CAD.
- To conceptualize drafting and modelling in CAD.
- To interpret the various features in the menu of modelling package.
- To synthesize various parts or components in an assembly

Expected Course Outcomes:

After completing this course, participants will be able to:

- Use the commands and features of a CAD software.
- Carry out preparations for making 2D mechanical drawings.
- Develop new drawings and modify 2D mechanical drawings using CAD system.
- Develop assembly drawings as per specifications.
- Communicate effectively about geometry and intent of design features.

Theory

UNIT-I

Introduction: Computer graphics & its terminology, CAD definition, concept & need CAD process, Functional areas of CAD, Coordinate systems

UNIT-II

Transformation: Output primitives (points, lines, curves, etc.), 2D & 3D transformation (Translation, Scaling & rotation). Projections: orthographic & Isometric.

UNIT-III

Curves: Introduction, Analytic curves-line, circle, ellipse, parabola, hyperbola. Synthetic curves: Hermite cubic spline, biezer curve, B- spline curve

UNIT-IV

Surface Modelling: Introduction, Surface representation, Analytic surface, synthetic surfaces-hermite bi cubic surface, biezer surface, b- spline surface

UNIT-V

Solid Modelling: Introduction, Geometry & topology, solid representation, boundary representation, sweep representation.

Lab Work:

Sr. No.	Experiment
1	Starting the software; Setting the paper size, space; setting the limits, units; use of snap and gridcommands.
2	Drawing of primitives (Line, arc, circle, ellipse, triangle etc.)
3	Drawing a flange.
4	Drawing a bushing assembly.
5	Dimensioning the drawing and adding text.
6	Setting the layers and application of layers.
7	Isometric and Orthographic projections.
8	Viewing in three dimensions.
9	Removal of hidden lines – Shading and Rendering.
10	Assigning material and calculation of mass properties.

Text Book: -

- CAD by Sadhoo Singh by Khanna Publisher
- CAD/CAM/CIM – P. Radhakrishnan, S. Subramanian& V. Raju, New Age International Pvt. Ltd., New Delhi, 3rd Edition

Reference Book

- CAD by Vikram Sharma

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