Scheme & Syllabus Sem -1 & 2 (B.Voc Solar Technology)

Semester-I														
Category	Subject Name	Credits			Marks							Hrs		
					Theory			Practical			Total			
		T	P	TO	I	E	TO	I	E	TO	(T+P)	T	P	TO
General Education Component	Applied Mathematics	4		4	70	30	100	-	-	-	100	60	-	60
	Communication Skills	3	1	4	15	35	50	35	15	50	100	45	30	75
	Basics of Electrical & Electronics Engg.	3	1	4	15	35	50	35	15	50	100	45	30	75
	Fundamental of Computers	3	1	4	15	35	50	35	15	50	100	45	30	75
	Fundamentals of Industrial Management & Safety	3	1	4	15	35	50	35	15	50	100	45	30	75
	Total	16	4	20	130	170	300	140	60	200	500	240	120	360
Skill Education Component	Fundamentals of solar energy & Plumbing Engg.	3	1	4	15	35	50	35	15	50	100	45	30	75
	Measurement and Metrology	3	1	4	15	35	50	35	15	50	100	45	30	75
	Engineering Graphics and Drawing	0	4	4	-	-	-	70	30	100	100	-	120	120
	Total	6	6	12	15	70	100	140	60	200	300	90	180	270
Grand Total		22	10	32	145	240	400	280	120	400	800	330	300	630

SUBJECT: COMMUNICATION SKILLS

Unit-1

Communication:

Meaning of Communication, Importance of Communication, Types of communication. Process of communication, Communication network in an organization, Barriers to communication, Essentials of good communication.

Unit-II

Remedial English Grammar:

Articles, agreement between verb and subject, uses of tenses, Modal and their uses, Active Passive Voice.

Understanding and applying Vocabulary: One word substitutes, Synonyms and Antonyms

Unit-III

Listening Skills:

process of listening, Types of listening, Effective Listening, Benefits of effective listening, Barriers to listening.

Unit-IV

Reading Skills:

Drama-Refund by Fritz Karinthy

Poems-Mending Wall by Robert Frost , Death The Leveller by James Shirley

Story-The Gift of the Magi by O. Henry

Essay- Toasted English by R K Narayan

Unit-V

Writing Skills:

Main Forms of Written Communication: Notices, Drafting an E-mail. Correspondence: Personal and Official, Report Writing, Preparing agenda and minutes of meetings.

Books Recommended

Text Books

1. Sethi, J & et al. A Practice Course in English Pronunciation, Prentice Hall of India, New Delhi.
2. Sen, Leena. Communication Skills, Prentice Hall of India, New Delhi.
3. Prasad, P. Communication Skills, S.K. Kataria& Sons.
4. Bansal, R.K. and J.B. Harrison. Spoken English, Orient Language.
5. Roach Peter. English Phonetics and Phonology.
6. A.S. Hornby's. Oxford Advanced Learners Dictionary of Current English, 7th Edition.
7. Prasad, P. The Functional Aspects of Communication Skills, Delhi.
8. McCarthy, Michael. English Vocabulary in Use, Cambridge University Press.
9. Rajinder Pal and PremLata. English Grammar and Composition, Sultan Chand Publication.
10. Idioms & Phrases (English-Hindi), Arihant Publication (India) Pvt. Ltd.
11. One Word Substitution, Dr. Ashok Kumar Singh, Arihant Publications (India) Pvt, Ltd

List of Experiments:

1. Greeting and starting of conversation.
2. Nonverbal communication techniques during conversation.
3. Verbal communication techniques during conversation.
4. Group discussion.
5. Extempore public speaking.
6. Reading activity
7. Situational dialogues /Role play.

8. PPT presentation technique.

SUBJECT: MATHEMATICS

Unit 1

Algebra:

- **1.1.** Set theory
- **1.2.** Permutation and Combination
- **1.3.** Binomial theorem (expansion without proof)
- **1.4.** Types of functions – linear, quadratic, polynomial, exponential and logarithmic

Unit 2

Trigonometric functions:

- **1.5.** Review of ratio of some standard angles (0, 30, 45, 60, 90 degrees)
- **1.6.** Addition, subtraction and product formulae
- **1.7.** Multiple and submultiples angles (2A, 3A, A/2)
- **1.8.** Height and distance

Unit 3

Determinants and matrix:

- **1.9.** Introduction to Determinant and matrices
- **1.10.** Algebra of matrices (up to third order)
- **1.11.** Inverse of matrix by Adjoint method (up to second order)
- **1.12.** Solution of system of linear equations by Cramer's rule

Unit 4

Differential calculus:

- **1.13.** Rules of differentiation – simple standard forms (involving one variable)
- **1.14.** Derivatives of algebraic and trigonometric functions
- **1.15.** Differentiation of function of a function
- **1.16.** Chain rule

Unit 5

Integral calculus:

- **1.17.** Integral of standard forms
- **1.18.** Simple integration by substitution
- **1.19.** Integration by parts and by fractions (for linear factor only)
- **1.20.** Evaluation of definite integrals

References:

1. NCERT- 11th and 12th Mathematics.
2. Advanced Engineering Mathematics, E. Kresyzig, John Wiley and Sons. (latest edition).
3. Higher Engineering Mathematics, B.S. Grewal, Khanna Publications
4. Advanced Engineering Mathematics, R.A Jain and S.R.K Iyengar. Narosa Publications.
5. Engineering Mathematics, N.P Bali, Laxmi Publications.

Subject Name: Measurement & Metrology

Course Objectives:

1. Understand metrology, its advancements & various measuring instruments
2. To study the fundamentals of modern measurement tools and laid standard procedures.
3. To study fundamentals of inspection methods and systems.
4. To acquaint with operation of precision measurement tools and equipment.

Learning Outcomes: Learner will be able to…

1. Explain different measuring instruments to measure the qualitative and quantitative characteristics of different mechanical components.
2. Evaluate quality of job, machine and instruments.
3. Perform calibration of measuring instruments.
4. Analyze parts/instruments for dimensional accuracy and functionality.
5. Describe functioning of force, torque, pressure, vibration and temperature measuring devices.
6. Explain tolerance, limits of size, fits, geometric and position tolerances, gauges and their design.
7. Understand the objectives of metrology, methods of measurement, selection of measuring instruments, standards of measurement and calibration of instruments.

Unit-1

Introduction to Measurement

Aim, Definition, types, need of inspection, terminologies, methods of measurements, units of measurement, selection of instruments, concept of error (systematic and random), sources of error, Measurement standards, calibration, statistical concepts in metrology.

Unit-2

Linear and Angular Measurements (To be taught partially in practical sessions)

Linear instruments, Surface plates (size, accuracy and material), slip gauges, Length bars– Calibration of the slip gauges, dial indicator, micrometers. Bevel protractor, spirit levels, sine bar, angle Gauges. Comparators, their types, relative merits and limitation.

Miscellaneous measurements: Taper & Radius measurement.

Unit-3

Measurement of Properties-Temperature, Force, weight, Pressure& flow, Noise, Lux and vibrations. Concept of fitting, tightening and torqueing in a line and its equipment.

Unit-4

Screw thread and Gear teeth metrology: **(To be taught partially in Practical Session)**

Screw Measurement: Introduction, screw thread terminology, screw thread measurement

Gear measurement: Introduction, types of gears, gear terminology, Gear Teeth Measurement, errors in gears, measurement of spur gear.

Unit-5

Linear Tolerancing and GD&T: (Partially in Practicals)

Limits, fits and tolerances: Interchangeability, selective assembly, limits, fit and tolerances, limit gauging, design of limit gauges, computer aided tolerancing.

Measurement of GD&T parameters: Measurement of straightness, flatness, squareness, parallelism, roundness, cylindricity, Interferometry

Measurement of surface finish: Introduction, terminology, surface roughness parameters, factors affecting surface roughness, ideal surface roughness.

Subject Name: Measurement & Metrology Lab **T** **P** **C**

Paper Code: BBME-104P **1 1**

Total Marks: 50 **Practical (External):15 Practical (Internal):35= 50**

Course Objectives:

1. To study the fundamentals of modern measurement and quality concepts.

2. To study fundamentals of inspection methods and systems

3. To acquaint with operation of precision measurement tools and equipment's.

Learning Outcomes: Learner will be able to…

1. Apply inspection gauge and checking systems.

2. Demonstrate the understanding of measuring instruments and their principle.

3. Analyze simple parts for dimensional accuracy and functionality using different instruments.

Experiments-

1. To Study and apply Linear Measuring Instruments for measurement of given specimens (Vernier calipers, scale, measuring tape etc.)
2. To Check bore diameter using bore dial gauge
3. To check pitch of thread using thread gauge: Ring gauge, plug gauge, micrometer etc.
4. To study of Radius gauge and Depth gauge, Filler and other similar gauges used in the industry.
5. To check Outer Diameter and Internal Diameters of given components using Air gauges.
6. Measurement of Taper Angle Using Slips, Rollers & Sine bar.
7. Demonstration of UTM.

SUBJECT: BASICS OF ELECTRONICS & ELECTRICALS
Unit 1

D.C Circuits: Definition of Voltage, Current, Power, Resistance, Inductance and Capacitance with their units, Ohm's law, kirchoff's Law, Series -Parallel Circuit, Conversion of Current and Voltage Source.

Unit 2

Three Phase A.C Circuits: Generation of 3 phase E.M.F, Difference between three-phase and single-phase supply, Star connection, Delta Connection and its Conversion.

Unit 3

Electrical Machines: Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Transformer, Induction Motor, Servo & Stepper motors.

Unit 4

Protective Devices & Safety Precautions: Introduction to PPE (Personal Protective Equipment) & Safety Precautions, Introduction of Relays, Contactors, MCBs, ELCBs, Fuses, Concept of Neutral and Earthing.

Unit 5

Semiconductor Devices & its Applications: Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications, transistor – PNP and NPN, symbols, identification of terminals of transistor, current flowing in a transistor, its characteristics and uses. Characteristics and applications of a thyristor.

Learning Outcomes:

- Able to understand the concept of Current, Voltage and Power.
- Able to understand the concept of Transformers and Motor.
- Able to understand the concept of Relay and Circuit Breaker.
- Able to understand the concept of Semiconductor diodes &Bipolar Junction Transistor.

Text Books

- Basic of Electrical and Electronics Engineering by S.kSahdev, Dhanpatrai Publications,2013.
- Text Book of Electrical Technology by B.LTheraja, S.Chand Publications,2014

Reference Books

- A Course in Electrical Technology by J.B Gupta, Katson Publications,2013
- Electrical Technology by J.S Katre, Techmax Publications, 2016

List of Experiments

1. Introduction of tools, symbols and abbreviations.
2. To verify kirchoff's current & voltage law.
3. Construction & Working of DOL starter.
4. Construction & Working of Star-Delta starter.
5. Construction & Working of Distribution Board and Extension Board.
6. To perform open circuit test and short circuit test of a single-phase transformer.
7. Draw V-I characteristics of P-N junction diode.
8. Draw input and output characters of a transistor.
9. Draw reverse break down characteristics of a zener diode.
10. Construction & Working of Half Wave & Full Wave rectifier on bread board.

SUBJECT: Fundamentals of Solar Energy & Plumbing Engg.

Unit 1

Introduction to Energy Sources

Energy sources and their availability- Conventional energy sources- Renewable energy sources- Need of renewable energy sources.

Blackbody radiation, Stefan - Boltzmann law - Photoelectric effect

Unit 2

Solar Energy

Potential of Solar Energy-solar radiation and Measurement-types of solar energy collectors-Solar water heating systems- Solar air heating and cooling Systems-Solar thermal electric conversion- Solar photovoltaic System-Other applications of solar energy like distillation, pumping, furnace, green house etc.

UNIT 3

SOLAR CELLS & CONCENTRATION OF SOLAR ENERGY

Formation of a pn – junction, Structure of a solar cell - The solar cell equation. Three types of imaging optics: trough or linear collectors, central receiver with heliostats, and parabolic dish concentrator with on - axis tracking- Solar thermal electricity using Stirling engine or Ranking engine - Solar photovoltaic with concentration

UNIT 4

ENERGY STORAGE

Necessity of storage for solar energy- Chemical energy storage - Thermal energy storage - Thermal Flywheels - Compressed air- Rechargeable batteries.

Unit 5

Basics of Plumbing

Pipes

Introduction, pipe materials,Types of water & Pipes used – grey, black, potable water & pipe used, orientation of pipes,Types of pipes(including Flexible piping)**,** Pipe Joint Methods - Soldering, Brazing and Welding.

Pipe fittings

Type of Fittings - elbows, weld tee, stub in, couplings, reducers, weld cap, screwed and socket welded fittings, Pipe nipples, flanged fittings and use of fittings.

Reference

1. Non-conventional energy sources; G.D.Rai; 2011; Fifth Edition, Khanna Publishers.

2. Solar Thermal and Biomass Energy; G. Lorenzini, C. Biserni & G. Flacco; 2010; First Edition; WIT Press, UK.

Text Book

1. Non-conventional energy sources; G.D.Rai; 2011; Fifth Edition, Khanna Publishers

SUBJECT: FNDAMENTALS OF COMPUTERS

Unit I –

Introduction to Computer System:
1.1 What is Computer, Basic Applications of Computer; Block Diagram of Computer System
1.2 Input / Output Devices, Computer Memory, Concepts of Hardware and Software, Data and Information; Applications of IECT.
1.3 Computer Virus: Definition, Types of viruses, Characteristics of viruses, Anti-virus software,
1.4 Introduction to number system.

Unit II –

Operating System:
Overview of operating system: Definition, Functions of operating system, Need and its services, Types of operating system, Batch Processing, Spooling, Multiprocessing, Multiprogramming, Time-Sharing, On-Line Processing, Real-Time Processing Basics of window operating system, Comparison between DOS and windows, Switching between DOS and windows, Comparison between Unix and Windows.

Unit III –

Understanding Office Applications:
Introduction to MS Word, Introduction to MS Excel and its applications, Introduction to MS PowerPoint, Menus, Shortcuts, Document types, formatting documents, spread sheet and presentations, working with Spreadsheets, Different templates, Macros, Mail merge.

Unit IV-
Networking:
Network Technologies, Introduction to Internet and protocols: TCP/ IP, Network connecting devices, Topologies, HTTP, HTTPS DNS, Hub, Switches, Router, Repeater, Firewalls, Digital Signature.
Unit V:

Introduction to World Wide Web:

WWW and Web Browsers Introduction, Objectives, Concept of internet, Overview of search engines, popular search engines in use, Surfing the web and websites, Hosting your websites, Planning and Developing the websites, Internet service provider.

Books Recommended

Text Books

1. Computers and Beginners by Jain, V.K.;
2. Computer Fundamentals by Anita Goel, Pearson.

Reference Books

1. Introduction to Information Technology, Leon Tech World by Leon and Leon
2. Foundations of Computing, BPB Publiction by Sinha, Kr. Pradeep and Preeti Sinha;
3. Word Processing and Typing by Sharon Spencer, Heinemann.
4. MS Office by S.S. Srivastava, Firewall Media.
5. Microsoft Office 2010 by Bittu Kumar, V & S Publications
6. Data Communication and Networking by Behrouz.A. Forouzan, McGraw Hill

Web Linkshttp://cec.nic.in/E-Content/Pages/default.aspx

List of Experiments

1. Troubleshooting
2. Practical based on to be exposed/shown various components and supposed how to switch on a computer.
3. Handling Boot Setup, Installation of Operating System, Connecting your client to server, User and Workgroup Handling, General Operating system handling and related topics.
4. WordPad, Notepad, Sticky Note, Snipping tool, Paint
5. M.S. Word
6. MS-Excel- Creating charts, Creating tables
7. MS-PowerPoint
8. MS-Outlook
9. Case study on Operating systems (Windows/ Ubantu/ Android/IoS)
10. Networking
11. Software: Preparatory and open domain

Subject Name: Engineering Graphics and drawing Lab

CATEGORY: Skill Education Component

OBJECTIVES

1. Understand and appreciate the importance of Engineering Graphics in Engineering
2. Understand the basic principles of Technical/Engineering Drawing
3. Understand the different steps in producing drawings according to BIS conventions

OUTCOMES

1. The student will become familiar with fundamentals of various science and technology subjects and thus acquire the capability to applying them
2. The graduates will become familiar with fundamentals of engineering design. Understanding the concept generation, design optimization and evaluation.
3. Students will be able to effectively design various engineering components and make process plan for the production.

SKILL SET

1. Projection of various components according to BIS specifications.
2. Assembly of data and information of various components in visualized way
3. Interpretation of technical graphics assemblies

CONTENTS

1. **Introduction to drawing, lines and lettering:**
   - **1.1.** Definition and classification of drawing
   - **1.2.** Drawing instruments such as; drawing board, drawing sheets, drafter.
   - **1.3.** Types of pencils, sheets, eraser etc.
   - **1.4.** Different types of lines(Straight line, inclined line and curved lines)
   - **1.5.** 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.

2. **Dimensioning and scale:**
   - **2.1.** Importance of dimensioning
   - **2.2.** Types (i.e. chain, parallel and progressive etc.) and methods of placing dimensioning (i.e. aligned and unidirectional)
   - **2.3.** Principles of dimensioning and practice dimensioning technique as BIS: SP: 46-2003.
   - **2.4.** 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.

3. **Introduction to Projection:**
   - **3.1.** Introduction to first and third angle projection
   - **3.2.** Introduction to projection of point, line and plane
   - **3.3.** 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.

4. **Isometric and Orthographic projection**
   - **4.1.** Isometric drawing of simple geometric solids
   - **4.2.** 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.**

5. **Geometric and dimensioning Tolerance**
   - **5.1** Component Drawing and interpretation
   - **5.2** Geometric dimension and Tolerance
   - **5.3** Introduction to software used in drawing

Hands on training:

- **Prepare drawing sheets by using GD&T in drawing**

Text Book

1. Engineering Drawing Plane and Solid Geometry : N.D. Bhatt and V.M. Panchal, Forty-
2. Fourth Edition 2002, Charotar Publishing House.
3. Engineering Drawing: Laxmi Narayan and Vaishwanar, Charotar Publishing House.
4. Engineering Graphics and Drafting: P.S. Gill, Milenium Edition, S.K. Kataria & Sons.
5. Engineering Graphics using AUTOCAD 2007 : T. Jeyapoovan,m First Edition 2002, Vikas Publishing House.

Sem 2

Semester-II															
Category	Subject Name	Credits			Marks							Hrs			
					Theory			Practical			Total				
		T	P	TO	I	E	TO	I	E	TO	(T+P)	T	P	TO	
General Education Component	Industrial & Project safety/MOOC	2	0	2	30	70	100	0	0	0	100	30	0	30	
	Entrepreneurship Development	2	0	2	30	70	100	0	0	0	100	30	0	30	
	Total	4	0	4	60	140	200	0	0	0	200	60	0	60	
Skill Education Component	OJT	0	24	24	-	-	0	245	105	350	350	0	1080	1080	
	Total	0	24	24	0	0	0	245	105	350	350	0	1080	1080	
Grand Total		4	24	28	60	140	200	245	105	350	550	60	1080	1140	

Subject Name: Entrepreneurship Development

Learning Outcome

The course will create awareness among the students about the entrepreneurship and factors that will help in facilitating the entrepreneurial development with a focus on new ventures/ start ups.

Objectives

- Enable the students to develop the insight needed to discover and create entrepreneurial opportunities.
- Successfully start and manage their own businesses to take the advantage of these opportunities.

Unit 1:

1.1 Entrepreneurship- Meaning, Nature and Scope 1.2
1.2 Characteristics and Qualities of a Successful Entrepreneur
1.3 1.3 Relationship between Entrepreneurship Development and Economic Development.

Unit 2:

2.1 Entrepreneurship and Society
2.2 New Venture Development- Meaning and Stages
2.3 Sources of Financing Entrepreneurship, Managerial Vs Entrepreneurial Approach.

Unit 3:

3.1 EDP Programmes, Concept of Economic Freedom, Financial Markets and Entrepreneurship

3.2 Venture Capital; Angel Capital, Project Report Preparation, Balance Sheet, Cash Statement, Asset Vs Liability Gamification.

Unit 4:

4.1 Entrepreneurial Strategies and Business Plan, Presenting Business Plans to the Investors

4.2 Future of Entrepreneurship in India.

Unit 5:

Women Entrepreneurship and Marketing Strategy:

5.1 Concept, Factors governing women entrepreneurship, Schemes for women entrepreneurship

5.2 Rural Entrepreneurship, Concept, advantage and challenges, Introduction to Market Forecasting.

Suggested Readings

- Dollinger, MJ, Entrepreneurship- Strategies and Resources, Pearson Education.
- Desai,Vasant, Entrepreneurship Development, Himalaya Publishing House.
- Gupta, C.B. and Srinivasan, P., Entrepreneurship Development, Sultan Chand & Sons.
- Charanthimath, P.M., Entrepreneurship Development and Small Business Enterprise, Pearson Education.

Havinal, Veerbhadrappa, Management and Entrepreneurship, 1st Edition, New Age International Publishers, 2008.