Teaching and Evaluation Scheme for First Year B. Tech. (All Branches)

<u>Group A</u>

	S	emester	Ι						
Course Code Course Title		Teaching Scheme		Evaluation Scheme					
		L	Т	Р	CA	MSE	ESE	Total	Credit
Mandatory	Induction Program	3-weeks duration in the beginning of semester.							
BTBS101	Engineering Mathematics- I	3	1	-	20	20	60	100	4
BTBS102	Engineering Physics	3	1	-	20	20	60	100	4
BTES103	Engineering Graphics	2	-	-	20	20	60	100	2
BTHM104	Communication Skills	2	-	-	20	20	60	100	2
BTES105	Energy and Environment Engineering	2	-	-	20	20	60	100	2
BTES106	Basic Civil and Mechanical Engineering	2	-	-	50	-	-	50	Audit
BTBS107L	Engineering Physics Lab	-	-	2	60	-	40	100	1
BTES108L	Engineering Graphics Lab	-	-	4	60	-	40	100	2
BTHM109L	Communication Skills Lab.	-	-	2	60	-	40	100	1
		14	2	8	330	100	420	850	18
	S	emester	II						
BTBS201	Engineering Mathematics-II	3	1	-	20	20	60	100	4
BTBS202	Engineering Chemistry	3	1	-	20	20	60	100	4
BTES203	Engineering Mechanics	2	1	-	20	20	60	100	3
BTES204	Computer Programming in C	3	-	-	20	20	60	100	3
BTES205	Workshop Practices	-	-	4	60	-	40	100	2
BTES206	Basic Electrical and Electronics Engineering	2	-	-	50	-	-	50	Audit
BTBS207L	Engineering Chemistry Lab	-	-	2	60	-	40	100	1
BTES208L	Engineering Mechanics Lab	-	-	2	60	-	40	100	1
BTES210S	Seminar	-	-	2	60	-	40	100	1
BTES211P	Field Training / Internship/Industrial Training (minimum of 4 weeks which can be completed partially in first semester and second Semester or in at one time).	-	-	-	-	-	-	-	Credits To be evaluate d in III Sem.
		13	3	10	430	80	440	950	19
		27							

Teaching and Evaluation Scheme for First Year B. Tech. (All Branches)

<u>Group B</u>

Semester I									
Course Code	Course Title	Teaching Scheme		Evaluation Scheme					
		L	Т	Р	CA	MSE	ESE	Total	Credit
Mandatory	Induction Program	3-weeks duration in the beginning of semester.							
BTBS101	Engineering Mathematics- I	3	1	-	20	20	60	100	4
BTBS102	Engineering Chemistry	3	1	-	20	20	60	100	4
BTES103	Engineering Mechanics	2	1	-	20	20	60	100	3
BTES104	Computer Programming in C	3	-	-	20	20	60	100	2
BTES105L	Workshop Practices	-	-	4	60	-	40	100	2
BTES106	Basic Electrical and Electronics Engineering	2	-	-	50	-	-	50	Audit
BTBS107L	Engineering Chemistry Lab	-	-	2	60	-	40	100	1
BTES108L	Engineering Mechanics Lab	-	-	2	60	-	40	100	1
		13	03	10	370	80	400	850	18
			25						
	Se	mester	II			I	I	1	L
BTBS201	Engineering Mathematics-II	3	1	-	20	20	60	100	4
BTBS202	Engineering Physics	3	1	-	20	20	60	100	4
BTES203	Engineering Graphics	2	-	-	20	20	60	100	2
BTHM204	Communication Skills	2	-	-	20	20	60	100	2
BTES205	Energy and Environment Engineering	2	-	-	20	20	60	100	2
BTES206	Basic Civil and Mechanical Engineering	2	-	-	50	-	-	50	Audit
BTBS207L	Engineering Physics Lab	-	-	2	60	-	40	100	1
BTES208L	Engineering Graphics Lab	-	-	3	60	-	40	100	2
BTHM209L	Communication Skills Lab.	-	-	2	60	-	40	100	1
BTES210S	Seminar	-	-	2	60	-	40	100	1
BTES211P	Field Training / Internship/Industrial Training (minimum of 4 weeks which can be completed partially in first semester and second Semester or in at one time)	-	-	-	-	-	-	-	Credits To be evaluate d in III Sem.
		14	02	09	390	100	460	950	19
		26							

BTBS101EngineeringMathematics-I

Course Objectives:

- 1. To know the application of the matrix technique (Linear algebra) to find solutions of system of linear equations arising in many engineering problem
- 2. To know and apply the concept partial derivatives and their applications to Maxima/ Minima, series expansion of multi valued functions.
- 3. To understand Computation of Jacobian of functions of several variables and their applications to engineering problems
- 4. To identify and sketch of curves in various coordinate system.
- 5. To evaluate multiple integrals and their applications to area and volume.

Course Outcomes:

Students will be able to :

- 1. Apply the matrix technique (Linear algebra) to find solutions of system of linear equations arising in many engineering problem
- 2. Demonstrate the concept partial derivatives and their applications to Maxima/ Minima, series expansion of multi valued functions.
- 3. Compute Jacobian of functions of several variables and their applications to engineering problems
- 4. Identify and sketch of curves in various coordinate system.
- 5. Evaluate multiple integrals and their applications to area and volume.

Unit 1:Linear Algebra- Matrices

Inverse of a matrix by Gauss-Jordan method; Rank of a matrix; Normal form of a matrix; Consistency of non-homogeneous and homogeneous system of linear equations; Eigen values and eigen vectors; Properties of eigen values and eigen vectors (without proofs); Cayley- Hamilton"s theorem (without proof) and the applications.

Unit 2:Partial Differentiation

Partial derivatives of first and higher orders; Homogeneous functions – Euler"s Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables.

Unit 3: Applications of Partial differentiation

Jacobians - properties; Taylor"s and Maclaurin"s theorems (without proofs) for functions oftwo variables; Maxima and minima of functions of two variables; Lagrange"s method ofundetermined multipliers.

Unit 4: Reduction Formulae and Tracing of Curves

Reduction formulae for $\int_0^{\frac{\pi}{2}} \sin^n x \, dx, \int_0^{\frac{\pi}{2}} \cos^n x \, dx, \int_0^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx$, Tracing of standard curves given in Cartesian, parametric & polar forms.

Unit 5: Multiple Integra

[07 Hours]

[07 Hours]

[07Hours]

[07Hours]

[08 Hours]

Double integration in Cartesian and polar co-ordinates; Evaluation of double integrals by changing the order of integration and changing to polar form; Triple integral; Applications of multiple integrals to find area as double integral, volume as triple integral and surface area.

Text Books

- 1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.
- 2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.
- 3. A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
- 4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
- 5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

- 1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
- 2. A Text Book of Engineering Mathematics by Peter O" Neil, Thomson Asia Pte Ltd., Singapore.
- 3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., NewDelhi.

General Instructions:

The tutorial classes in Engineering Mathematics-I are to be conducted batchwise. Each class should be divided into three batches for the purpose.

The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.

The minimum number of assignments should be eight covering all topics.

4 Credits

Course Objectives:

- 1. To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.
- 2. To understand and study the Physics principles behind the developments of Engineering materials.

Course Outcomes:

Students will be able to :

- 1. Explain & apply the concept of types of Oscillation,Dielectric properties & ultrsonics
- 2. Explain & compare between Interference & Polarisation of light ,working Principle of Lasers & Fiber optics
- 3. Interprete, apply & demonstrate principle of motion of charged particles in EF&MF, BAinbridge Mass spectrograph & G M counter
- 4. Identify Types of crystals & crystal planes using Miller indices, Experemental apprroach.

Unit I: Oscillation and Ultrasonics:

Free oscillation, damped oscillation, Forced oscillation and Resonance, differential wave equation, Ultrasonic waves, production of ultrasonics (Piezoelectric effect, Magnetostriction effect) and its applications

Unit II: Optics, Fibre Optics and Laser:

Interference of light in thin film, wedge shaped film, Newton^{*}s rings, polarization of light, methods for production of polarized light(Reflection, Refraction& Double refraction), Huygen^{*}s theory of double refraction, Principle and structureof optical fibre, acceptance angle, acceptance cone, numerical aperture.

Principle of laser, Types of laser – Ruby and He-Ne laser and their applications.

Unit III: Electron Optics, Nuclear and QuantumMechanics: (07 Hrs) Motion of electron in Electric field (parallel and perpendicular), Motion of electron in magnetic field, motion of electron in combined effect, Bainbridge mass spectrograph,

G. M counter, Heisenberg^{*}s uncertainty principle, Schrödinger^{*}s time dependent and time independent wave equations, physical significance of wave function.

Unit IV: Crystal Structure, X-rays and Electrodynamics (07 Hrs) Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination

unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, X-ray diffraction, Line and Continuous Spectrum of Xray, Introduction of Maxwell equations (no derivation).

Unit V: Magnetic, Superconducting and Semiconducting materials: (07 Hrs) Types of magnetic materials (Diamagnetic, Paramagnetic and Ferromagnetic), B-H curve, Superconductivity, types of superconductors, Meissner effect, properties and

(07 Hrs)

(07 Hrs)

applications of superconductor, Band theory of solids, conductivity of semiconductors, Halleffect.

Expected Outcome:

- 1. The student will be able to understand Engineering problems based on the principle of Oscillation, Ultrasonics, Optics, Laser, Fibre optics, Nuclear physics, Quantum mechanics.
- 2. The student will be able to understand Fundamental of Electrodynamics, Semiconductor, Dielectric, Magnetic and Superconducting materials which forms the base of many modern devices and technologies.

Text books:

- 1. Engineering Physics M.N.Avadhanulu and P.G. Kshirsagar. S.Chandand Company LTD.
- 2. Engineering Physics Dr. L. N. Singh. SynergyKnowledgeware-Mumbai.
- 3. Engineering Physics-R.K. Gaur and S. L.Gupta.Dhanpat Rai Publications Pvt. Ltd.-NewDelhi.
- 4. Fundamental of Physics Halliday and Resnik. Willey EasternLimited.

Reference books:

- 1. Introduction to Electrodynamics David R.Griffiths.
- 2. Concept of Modern Physics Arthur Beizer.TataMcGraw-HillPublishing Company Limited.
- 3. Optics Ajoy Ghatak, MacGraw Hill Education (India) Pvt.Ltd.
- 4. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan. New Age InternationalPvt.Ltd.
- 5. Solid State Physics A.J. Dekker. McMillan India–Limited.
- 6. The Feynman Lectures on Physics VolI, II, III.
- 7. Introduction to solid state physics Charles Kittel. John Willey and Sons

Engineering physics Lab:

Atleast 10 experiments should be performed from the following list

- 1. Newton's rings Determination of radius of curvature of Plano convex lens / wavelength of light
- 2. Wedge Shaped film Determination of thickness of thin wire
- 3. Half shade Polarimeter Determination of specific rotation of optically active material
- 4. Laser Determination of wavelength of He-Ne laser light
- 5. Magnetron Tube Determination of "e/m" of electron
- 6. G.M. Counter Determination of operating voltage of G.M. tube
- 7. Crystal Plane Study of planes with the help of models related Miller Indices
- 8. Hall Effect Determination of Hall Coefficient
- 9. Four Probe Method Determination of resistivity of semiconductor
- 10. Measurement of Band gap energy of Semiconductors
- 11. Study of I-V characteristics of P-N junction diode
- **12.** Experiment on fibre optics
- **13.** Ultrasonics Interferometer
- **14.** B-H Curve Experiment
- 15. Susceptiblity measurement experiment

BTES103/203 Engineering Graphics

2 Credits

First Year B. Tech Classes (Common to all Branches)

Course Objectives:

- 1. To make use of drawing instruments effectively for drawing and dimensioning.
- 2. To understand the conventions and methods of engineering drawing.
- 3. To know the concept of projections of points, lines, planes, solids and section of solids.
- 4. To understand the Construction isometric and orthographic views of given objects.

Course Outcomes:

Students will be able to :

- 1. Use of drawing instruments effectively for drawing and dimensioning.
- 2. Explain conventions and methods of engineering drawing.
- 3. Apply concept of projections of points, lines, planes, solids and section of solids.
- 4. Construct isometric and orthographic views of given objects.

Unit 1: Drawing standards and geometrical construction:

Drawing standard SP: 46, Type of lines, lettering, dimensioning, scaling conventions. Geometrical construction: Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and a hexagon.

Unit 2: Orthographic Projections and Projections of Points:

Introduction to orthographic projection, drawing of orthographic views of objects from their isometric views. Projection of points lying in four quadrants.

Unit 3: Projections of Straight Lines and Planes and their Traces:

Projections of lines parallel and perpendicular to one or both planes, projections of linesinclined to one or both planes. Traces oflines.

Projections of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes.

Unit4:Projections of Solids

Types of solids, projections of solids with axis perpendicular and parallel to HP and VP, solids with axis inclined to one or both the planes. Projections of spheres touching each other.

4hrs

4hrs

4hrs

4 hrs

Unit 5: Sectioning of Solids, Isometric Projections

4hrs

Sectioning of solids: Section planes perpendicular to one plane and parallel or inclined to other plane. Isometric projections: Isometric scale, drawing of isometric projections from given orthographic views.

Reference/Text Books:

- 1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 46th Edition, 2003.
- 2. K. V. Nataraajan, *A text book of Engineering Graphic*, Dhanalakshmi Publishers, Chennai, 2006.
- 3.K. Venugopal and V. Prabhu Raja, *Engineering Graphics*, New Age International (P) Ltd, 2008.
- 4. DhananjayA.Jolhe,*EngineeringDrawingwithanIntroductiontoAutocad*,Mc GrawHill Education, 2017

BTES108L Engineering Graphics Lab

Practical Scheme:	Examination Scheme:				
Practical: 3 hrs/batch	Internal Assessment: 60 Marks				
	External Exam: 40 Marks				

Course Contents:

Llist of Experiment

- 1. Lines, lettering and dimensioning.
- 2. Geometrical Constructions.
- 3. Orthographic projections.
- 4. Projections of points and straight lines
- 5. Projections of planes.
- 6. Projections of solids.
- 7. Section of solids.
- 8. Isometric Projections.

BTHM104/204 Communication Skills

2 Credits

Course Objectives:

- 1. To know and apply speaking and writing skills in professional as well as social situations
- 2. To Overcome Mother Tongue Influence and demonstrate neutral accent while exercising English
- 3. To know and apply communication skills for Presentations, Group Discussion and interpersonal interactions.
- 4. To know and apply grammar correctly during Speaking and Writing situations especially in context with Presentations, Public Speaking, Report writing and Business Correspondence

Course Outcomes:

Students will be able to:

- 1. Apply speaking and writing skills in professional as well as social situations
- 2. Overcome Mother Tongue Influence and demonstrate neutral accent while exercising English
- 3. Apply communication skills for Presentations, Group Discussion and interpersonal interactions.
- 4.Apply grammar correctly during Speaking and Writing situations especially in context with Presentations, Public Speaking, Report writing and Business Correspondence

Unit 1: Communication and Communication Processes

Introduction to Communication, Forms and functions of Communication, Barriers toCommunication and overcoming them, Verbal and Non-verbal Communication Reading: Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Fast Reading, Strategies for Reading, Comprehension. Listening : Importance of Listening, Types ofListening, Barriers to Listening.

Unit 2: Verbal & Non-verbal Communication

Use of Language in Spoken Communication, Principles and Practice of Group Discussion, Public Speaking (Addressing Small Groups and Making Presentation), Interview Techniques, Appropriate Use of Non-verbal Communication, Presentation Skills, Extempore, Elocution.

Unit 3: Study of Soundsin English

Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of Different Sounds in English.

Unit 4:English Grammar

Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Synonyms and Antonyms, Common Errors.

Unit 5: Writing Skills, Reading Skills & Listening Skills

Features of Good Language, Difference between Technical Style and Literary Style, Writing Emails, Formal and Informal English, Technical Reports: Report Writing: Format, Structure and Types Letter Writing: Types, Parts, Layouts, Letters and Applications, Use of Different Expressions and Style, Writing Job Application Letter and Resume.

(04 hrs)

(02 hrs)

(05 hrs)

. . .

(04hrs)

(04 hrs)

Text book:

Mohd. Ashraf Rizvi, Communication Skills for Engineers, Tata McGraw Hill

Reference Books:

a.Sanjay Kumar, Pushp Lata, *Communication Skills*, Oxford University Press,2016 b.Meenakshi Raman, Sangeeta Sharma, *Communication Skills*, Oxford University Press,2017

c.Teri Kwal Gamble, Michael Gamble, Communication Works, Tata McGraw Hill Education, 2010

d.Anderson, Kenneth. Joan Maclean and Tossny Lynch. Study Speaking: A Course inSpoken English for Academic Purposes. Cambridge: CUP, 2004. e.Aswalthapa, K. *Organisational Behaviour*, Himalayan Publication, Mumbai(1991).

- f. Atreya N and Guha, *Effective Credit Management*, MMC School of Management, Mumbai (1994).
- g.Balan,K.R. and Rayudu C.S., *Effective Communication*, Beacon New Delhi(1996).
- h.Bellare, Nirmala. *Reading Strategies*. Vols. 1 and 2. New Delhi. Oxford University Press, 1998.
- i. Bhasker, W. W. S & Prabhu, N. S.: *English through Reading*, Vols. 1 and 2. Macmillan, 1975.
- j. Black, Sam. Practical Public Relations, E.L.B.S. London(1972).
- k.Blass, Laurie, Kathy Block and Hannah Friesan. Creating Meaning. Oxford: OUP,2007.
- 1. Bovee Courtland, L and Thrill, John V. *Business Communication*, Today McGraw Hill, New York, Taxman Publication(1989).

Communication Skill Lab:

Atleast 10 experiments should be performed from the following list

- 1) How to introduce oneself?
- 2) Introduction to Phonemic symbols
- 3) Articulation of sounds in English with proper manner
- 4) Practice and exercises on articulation of sounds
- 5) Read Pronunciations/transcriptions from the dictionary
- 6) Practice and exercises on pronunciations of words
- 7) Introduction to stress and intonation
- 8) Rapid reading sessions
- 9) Know your friend
- 10) How to introduce yourself
- 11) Extempore
- 12) Group discussion
- 13) Participating in a debate
- 14) Presentation techniques
- 15) Interview techniques

BTES105/205 Energy and Environment Engineering

Course Objectives:

- 1. To Identify conventional ,non conventional energy sources.
- 2. To understand the power consuming and power developing devices for effective utilization and power consumption
- 3. To Identify various sources of air, water pollution and its effects.
- 4. To understand noise, soil, thermal pollution and Identify solid, biomedical and hazardous waste.

Course Outcomes:

Students will be able to:

- 1. Identify conventional ,non conventional energy sources.
- 2. Knowand discuss power consuming and power developing devices for effective utilization and power consumption
- 3. Identify various sources of air, water pollution and its effects.
- 4. Know and discuss noise, soil, thermal pollution and Identify solid, biomedical and hazardous waste.

Unit 1: Conventional Power Generation:

Steam power station, Nuclear power plant – Gas turbine power plant- Hydro power station: Schematic arrangement, advantages and disadvantages, Thermo electric and thermionic generators, Environmental aspects for selecting the sites and locations of power plants.

Unit 2: Renewable Power Generation:

Solar, Wind, Biogas and Biomass, Ocean Thermal energy conversion (OTEC), Tidal, Fuel cell, Magneto Hydro Dynamics (MHD): Schematic arrangement, advantagesanddisadvantages.

Unit 3: Energy conservation

Scope for energy conservation and its benefits Energy conservation Principle- Maximum energy efficiency, Maximum cost effectiveness, Methods and techniques of energy conservation in ventilation and air conditioners, compressors, pumps, fans and blowers, Energy conservation in electric furnaces, ovens and boilers., lightingtechniques.

Unit 4: Air Pollution

Environment and Human health - Air pollution: sources- effects- control measures - Particulate emission, air quality standards, and measurement of airpollution.

Unit 5: Water Pollution

Water pollution- effects- control measures- Noise pollution -effects and control measures, Disposal of solid wastes, Bio-medical wastes-Thermal pollution - Soil pollution -Nuclear hazard.

Reference/Text Books:

1. A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, A Text book of Power System Engineering,

(4 hours)

(4 hours)

(4 hours)

(4 hours)

(4 hours)

2 Credits

Dhanpat Rai Publication.

- 2. Rai. G. D., Non Conventional Energy Sources, Khanna Publishers, Delhi,2006.
- 3. Rao S., Parulekar B.B., Energy Technology-Non conventional, Renewable And Conventional, Khanna Publishers, Delhi,2005.

- 4. Glynn Henry J., Gary W. Heinke, Environmental Science and Engineering, Pearson Education, Inc,2004.
- 5. J. M. Fowler, Energy and the Environment, McGraw-Hill, 2 nd Edition, 1984.
- 6. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Prentice Hall,2003.

BTES106/206 Basic Civil and Mechanical Engineering

Course Objectives:

- 1. To Identify various Civil Engineering materials and choose suitable material among various options.
- 2. To know and apply principles of surveying to solve engineering problem
- 3. To Identify various Civil Engineering structural components and select appropriate structural system among various options
- 4. To Explain and define various properties of basic thermodynamics, materials and manufacturing processes.
- 5. To know and discuss the working principle of various power consuming and power developing devices

Course Outcomes:

Students will be able to:

- 1. Identify various Civil Engineering materials and choose suitable material among various options.
- 2. Apply principles of surveying to solve engineering problem
- 3. Identify various Civil Engineering structural components and select appropriate structural system among various options
- 4. Explain and define various properties of basic thermodynamics, materials and manufacturing processes.
- 5. Know and discuss the working principle of various power consuming and power developing devices

Part I Basic Civil Engineering

Module 1: Introduction to civil engineering

Various Branches, role of civil engineer in various construction activities, basic engineering properties anduses of materials: earth, bricks, timber, stones, sand, aggregates, cement, mortar, concrete, steel, bitumen, glass, FRP, composite materials.

Module 2: Building Components & Building Planning

Foundation and superstructure, functions of foundation, types of shallow and deep foundations, suitabilityin different situation, plinth, walls, lintels, beams, columns, slabs, roofs, staircases, floors, doors, windows, sills, Study of Building plans, ventilation, basics of plumbing and sanitation

Module3: Surveying

Principles of survey, elements of distance and angular measurements, plotting of area, base line and offsets, introduction to Plane table surveying, introduction to levelling, concept of bench marks, reduced level, contours

(4hrs)

(4 hrs)

(4 hrs)

Audit

Part II Basic Mechanical Engineering

Unit 1: Introduction to Mechanical Engineering:

Introduction to Laws of Thermodynamics with simple examples pertaining to respective branches, IC Engines: Classification, Applications, Basic terminology, 2 and 4 stroke IC engine working principle, Power Plant: Types of Power plant; Gas power plant, Thermal power plant, Nuclear power plant, Automobiles: Basic definitions and objectives

(4 hrs)

Unit 2:

(4 hrs)

Design Basics, Machine and Mechanisms, Factor of safety, Engineering Materials: types and applications, basics of Fasteners Machining and Machinability, Introduction to Lathe machine, Drilling machine, Milling machine, basics of machining processes such as turning, drilling and milling, Introductiontocasting

Text Books

- Anurag Kandya, "Elements of Civil Engineering", Charotar Publishing, Anand
- M. G. Shah, C. M. Kale, and S. Y. Patki, "Building Drawing", Tata McGrawHill
- Sushil Kumar, "Building Construction", Standard PublishersDistributors
- •
- M. S. Palani Gamy, "Basic Civil Engineering", Tata Mc-Graw Hill Publication

Kanetkar T. P. and Kulkarni S. V., "Surveying and Levelling", Vols. I, II and III, VidyarthiGruh Prakashan, Pune

- Punmia, "Surveying", Vol.- I, Vol.-II, Vol.-III, Laxmi Publications
- G. K. Hiraskar, "Basic Civil Engineering", Dhanpat RaiPublications
- Gopi Satheesh, "Basic Civil Engineering", PearsonEducation
- P. K. Nag "Engineering Thermodynamics", Tata McGraw Hill, New Delhi 3rd ed.2005

Ghosh, A K Malik, "Theory of Mechanisms and Machines", Affiliated East West Press Pvt. Ltd. NewDelhi.

- Serope Kalpakaji and Steven R Schimd " Amanufacturing Engineering and Techology" Addision Wsley Laongman India 6th Edition2009
- . V. B. Bhandari, " Deisgn of Machine Elements", Tata McGraw Hill Publications, NewDelhi.

BTBS201 Engineering Mathematics – II

4 Credits

Course Objectives:

1. To know and discuss the need and use of complex variables to find roots ,to separate complex quantities and to establish relation between circular and hyperbolic functions.

2. To understand and solve first and higher order differential equations and apply them as a mathematical modeling in electric and mechanical systems.

3. To determine Fourier series representation of periodic functions over different intervals.

4. To Demonstrate the concept of vector differentiation and interpret the physical and geometrical meaning of gradient, divergence & curl in various engineering streams.

5. To know and apply the principles of vector integration to transform line integral to surface integral, surface to volume integral &vice versa using Green's, Stoke's and Gauss divergence theorems.

Course Outcomes:

Students will be able to:

1. Discuss the need and use of complex variables to find roots, to separate complex quantities and to establish relation between circular and hyperbolic functions.

2. Solve first and higher order differential equations and apply them as a mathematical modeling in electric and mechanical systems.

3. Determine Fourier series representation of periodic functions over different intervals.

4. Demonstrate the concept of vector differentiation and interpret the physical and geometrical meaning of gradient, divergence & curl in various engineering streams.

5. Apply the principles of vector integration to transform line integral to surface integral, surface to volume integral &vice versa using Green"s, Stoke"s and Gauss divergence theorems.

Unit 1: Complex Numbers

Definition and geometrical representation ; De-Moivre"s theorem(without proof) ; Roots of complex numbers by using De-Moivre"s theorem ; Circular functions of complex variable - definition ; Hyperbolic functions ; Relations between circular and hyperbolic functions ; Real and imaginary parts of circular and hyperbolic functions ; Logarithm of Complexquantities.

Unit 2: Ordinary Differential Equations of First Order and First Degree and

Their Applications

Linear equations; Reducible to linear equations (Bernoulli's equation); Exact differential equations; Equations reducible to exact equations ; Applications to orthogonal trajectories , mechanical systems and electrical systems.

Unit 3: Linear Differential Equations with Constant Coefficients

Introductory remarks - complementary function, particular integral; Rules for finding complementaryfunctions and particular integrals; Method of variation of parameters; Cauchy's homogeneous andLegendre"s linear equations.

Unit 4: Fourier Series

Introductory remarks- Euler"s formulae ; Conditions for Fourier series expansion - Dirichlet"s conditions ; Functions having points of discontinuity ; Change of interval ; Odd and even functions expansions of odd and even periodic functions ; Half-rangeseries.

[07 Hours]

[07 Hours]

[07 Hours]

[07 Hours]

Unit 5: Vector Calculus

[07 Hours]

Scalar and vector fields:Gradient , divergence and curl ; Solenoidal and irrotational vector fields; Vector identities (statement without proofs) ; Green"s lemma , Gauss" divergence theorem and Stokes"theorem (without proofs)

Text Books

- a. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.
- b. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork. c. A Course in Engineering Mathematics (Vol II) by Dr. B. B. Singh, Synergy Knowledge
- c. A Course in Engineering Mathematics (Vol II) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
 d. A Taut Daals of Applied Mathematics (Vol I & II) by D. N. Wartikar and J. N. Wartikar
- d. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
- e. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

- a. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
- b. A Text Book of Engineering Mathematics by Peter O" Neil, Thomson Asia Pte Ltd., Singapore.
- c. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., NewDelhi.

General Instructions:

- 1. The tutorial classes in Engineering Mathematics-II are to be conducted batchwise. Each class should be divided into three batches for thepurpose.
- 2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentageattendance.
- 3. The minimum number of assignments should be eight covering alltopics.

BTBS102/202 Engineering Chemistry

Course Objectives:

- 1. To know the demonstration of knowledge of Chemistry in technical fields.
- 2. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- 3. To understand and develop the importance of water in industrial and domestic usage.
- 4. To identify the concepts of Chemistry to lay the ground work for subsequent studies in various engineering fields.
- 5. To examine a fuel and suggest alternative fuels.

Course Outcomes:

Students will be able to:

- 1. Demonstrate knowledge of chemistry in technical fields.
- 2. Bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- 3. Develop the importance of water in industrial and domestic usage.
- 4. Identify the concepts of Chemistry to lay the ground work for subsequent studies in various engineering fields.
- 5. Examine a fuel and suggest alternative fuels.

Unit 1: Water Treatment

Introduction, Hard and Soft water, Disadvantages of hard water –In Domestic use, In Industrial use, Softening of water – Zeolite process, Ion exchange process, Hot Lime –Soda process, water characteristics- Hardness and its determination by EDTA method, Dissolved oxygen (DO) and its determination by Winkler"s method.

Unit 2: Phase Rule

Phase Rule, statement, Explanation of the terms – Phase, Component, Degrees of freedom. One component system – Water and Sulphur. Reduced Phase rule equation, Two component alloy system-Phase diagram of Silver- Lead alloy system.

Unit 3: Corrosion and its Control

Introduction, Fundamental reason of corrosion, Electrochemical Corrosion(Wet corrosion), Direct Chemical Corrosion(Dry corrosion), Factors affecting the rate of corrosion, Types of corrosion-Galvanic, Microbiological Corrosion, Methods to minimise the rate of corrosion-Proper designing, Cathodic and Anodic protection method.

Unit 4: Fuels and Lubricants

Fuels: Introduction, Classification of fuel, Calorific value of a fuel, Characteristics of a good fuel, solid fuel- Coal and Various types of Coal, Analysis of coal- Proximate and Ultimate analysis, Liquid fuel-Refining of Petroleum.

Lubricants: Introduction, classification of lubricants - Solid, Semi –solid and Liquid Lubricants, Properties of lubricants: Physical properties – Viscosity, Viscosity index, surface tension, Flash point and Fire point. Chemical properties – Acidity, Saponification.

Unit 5: Electrochemistry

Introduction – Definition and units of Ohm"s Law, Specific Resistance, Specific Conductance, Equivalent and Molecular Conductance. Method of conductance measurement by Wheatstone bridge method, Cell constant, Conductometric titrations, Nernst equation and its application for the calculation

(7L)

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4 Credits

of half-cell potential, Glass electrode, Fuel cell (H2O2), Advantages of fuel cell, Ostwald"s theory of acid- base indicator.

Text books:

- 1. Jain P.C & Jain Monica, Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 1992.
- 2. Bhal & Tuli, Text book of Physical Chemistry, S. Chand & Company, New Delhi.
- Shikha Agarwal, Engineering Chemistry- Fundamentals and applications, Cambridge Publishers -2015

Reference books:

- 1. Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi.
- 2. O. G. Palanna, Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi.
- 3. WILEY, Engineering Chemistry, Wiley India, New Delhi 2014.
- 4. S.S.Dara, Engineering Chemistry, McGraw Hill Publication, New Delhi.

Engineering Chemistry Lab:

At least 10 experiments should be performed from the following list

- 1. Determination of Hardness of water sample by EDTA method.
- 2. Determination of Chloride content in water sample by precipitation titration method.
- 3. Determination of Dissolve Oxygen in water by Iodometric method.
- 4. Determination of Percent purity of Bleaching Powder.
- 5. pH metric Titration (Acid Base titration)
- 6. Conductometric Titration (Acid Base titration)
- 7. Surface tension
- 8. Viscosity
- 9. To determine Acidity of water sample.
- 10. To determine Calorific value of a fuel.
- 11. Determination of Acid value of an oil sample.
- 12. Determination of Saponification value of an oil sample.
- 13. Experiment on water treatment by using Ion exchange resins.
- 14. To find out P-T curve diagram of steam.
- 15. To determine Alkalinity water sample.
- 16. Determination of rate of corrosion of metal.

Reference Books:

- 1. Systematic experiments in Chemistry, A. Sethi, New Age International Publication, New Delhi.
- 2. Practical Inorganic Chemistry, A. I. Vogel, ELBS Pub.
- 3. Practical in Engineering Chemistry, S. S. Dara.

BTES103/203 Engineering Mechanics

3 Credits

Course Objectives:

- 1. To know and apply fundamental Laws of Engineering Mechanics
- 2. To know and apply Conditions of static equilibrium to analyze given force system
- 3. To compute Centre of gravity and Moment of Inertia of plane surfaces
- 4. To compute the motion characteristics of a body/particle for a Rectilinear and Curvilinear Motion
- 5. To know and discuss relation between force and motion characteristics

Course Outcomes:

Students will be able to:

- 1. Apply fundamental Laws of Engineering Mechanics
- 2. Apply Conditions of static equilibrium to analyze given force system
- 3. Compute Centre of gravity and Moment of Inertia of plane surfaces
- 4. Compute the motion characteristics of a body/particle for a Rectilinear and Curvilinear Motion
- 5. Know and discuss relation between force and motion characteristics

Module1:BasicConcepts

(7Lectures)

Objectives of Engineering Analysis and Design, Idealization of Engineering Problems, Simplification of real 3D problems to 2-D and 1-D domain, Basis of Assumptions, types of supports, types of load, free body diagram, Laws of Motion, Fundamental principles, Resolution and composition of a forces, Resultant, couple, moment, Varignon's theorem, force systems, Centroid of composite shapes, moment of inertia of planer sections and radius of gyration

Module2: Equilibrium

Static equilibrium, analytical and graphical conditions of equilibrium, Lami"s theorem, equilibrium of coplanar concurrent forces, coplanar non concurrent forces, parallel forces, beams reactionsSimple trusses (plane and space), method of joints for plane trusses, method of sections for plane trusses Friction:Coulomb law, friction angles, wedge friction, sliding friction and rolling resistance

Module3:Kinematics

Types of motions, kinematics of particles, rectilinear motion, constant and variable acceleration, relative motion, motion under gravity, study of motion diagrams, angular motion, tangential and radial acceleration, projectile motion, kinematics of rigid bodies, concept of instantaneous center of rotation, concept of relativevelocity,

Module4:Kinetics

Mass moment of inertia, kinetics of particle, D'Alembert"s principle:applications in linear motion, kinetics of rigid bodies, applications in translation, applications in fixed axisrotation

Module5: Work, Power, Energy

Principle of virtual work, virtual displacements for particle and rigid bodies, work done by a force, spring, potential energy, kinetic energy of linear motion and rotation, work energyequation, conservation of energy, power, impulse momentum principle, collision of elasticbodies.

(7 Lectures)

(7 Lectures)

(6 Lectures)

(6 Lectures)

Text Books

- S. Timoshenko, D. H. Young, "Engineering Mechanics", McGraw Hill, 1995.
- Tayal A. K., "Engineering Mechanics", Umesh Publications, 2010.
- Bhavikatti S. S., Rajashekarappa K. G., "Engineering Mechanics", New Age International Publications, 2ndEdition.
- Beer, Johnston, "Vector Mechanics for Engineers", Vol. 1: Statics and Vol. 2: Dynamics, McGraw HilCompany Publication, 7th edition, 1995.
- Irving H. Shames, "Engineering Mechanics Statics and Dynamics", Pearson Educations, Fourth edition, 2003.
- McLean, Nelson, "Engineering Mechanics", Schaum"s outline series, McGraw Hill Book Company, N.Delhi, Publication.
- Singer F. L., "Engineering Mechanics Statics & Dynamics", Harper and Row Pub. York.
- Khurmi R. S., "Engineering Mechanics", S. Chand Publications, N.Delhi

Engineering Mechanics Lab:

Atleast 10 experiments should be performed from the following list

- 1. Polygon law of coplanar forces
- 2. Bell crank lever.
- 3. Support reaction for beam.
- 4. Problems on beam reaction by graphics statics method
- 5. Simple / compound pendulum.
- 6. Inclined plane (to determine coefficient of friction).
- 7. Collision of elastic bodies (Law of conservation of momentum).
- 8. Moment of Inertia of fly wheel.
- 9. Verification of law of Machine using Screw jack
- 10. Assignment based on graphics statics solutions
- 11. Any other innovative experiment relevant to Engineering Mechanics.
- 12. Centroid of irregular shaped bodies.
- 13. Verification of law of Machine using Worm and Worm Wheel
- 14. Verification of law of Machine using Single and Double Gear Crab.
- 15. Application of Spreadsheet Program for conceptslike law of moments, beam reactions, problems in kinematics, etc

BTES104/204 Computer Programming in C

2 Credits

Course Objectives:

1.To give a broad perspective about the uses of computers in engineering industry and C Programming.

2. To develop the basic concept of algorithm, algorithmic thinking and flowchart.

3. To apply the use of C programming language to implement various algorithms and develops the basic concepts and terminology of programming in general.

4. To make familiar the more advanced features of the C language.

5. To identify tasks in which the numerical techniques learned are applicable and apply them to write programs and hence use computers effectively to solve the task.

Course Outcomes:

Students will be able to:

1. Gain a broad perspective about the uses of computers in engineering industry and C Programming.

2. Develop the basic concept of algorithm, algorithmic thinking and flowchart.

3. Apply the use of C programming language to implement various algorithms and develops the basic concepts and terminology of programming in general.

4. Use the more advanced features of the C language.

5. Identify tasks in which the numerical techniques learned are applicable and apply them to write programs and hence use computers effectively to solve the task.

Unit 1: Process of programming:

Editing, Compiling, Error Checking, executing, testing and debugging of programs. IDE commands. Eclipse for C Program development, Flowcharts, Algorithms. (4 Lectures)

Unit 2: Types, Operators and Expressions:

Variablenames, Data types, sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and orderofevaluation.

(4 Lectures)

(4 Lectures)

Unit 3: Control Flow:

Statements and Blocks. If-else, else-if switch Loops while and for, do-while break and continue goto and Labels. Functions and Program Structure: Basic of functions, functions returning non-integers external variablesscoperules.

Unit 4: Arrays in C:

Initializing arrays, Initializing character arrays, multidimensional arrays.

Unit 5: Structures C:

Basics of structures, structures and functions arraysofstructures, Pointer in C. Pointers to integers, characters, floats, arrays, structures.

Special Note: <u>Topic of Pointers in C</u> is only for lab exercises and not for end semester examinations.

Reference/Text Books:

1. Brain W. Kernighan & Dennis Ritchie, The C Programming Language, Prentice Hall, 2nd Edition, 1988.

- 2. R. S. Bichkar, Programming with C, Orient Blackswan, 1st Edition, 2012.
- 3. Herbert Schildit, C the Complete Reference, McGraw-Hill Publication, 2000.
- 4. Balguruswamy, Programming in C,PHI.
- 5. Yashwant Kanitkar, Let Us C,PHI

Computer Programming in C Lab:

Atleast 10 experiments should be performed from the following list

- 1. Assignment on Flow Chart.
- 2. A Simple program to display a message "Hello world" on screen.
- 3. A Program to take input from user and display value entered by user on screen.

4. Basic example for performing different C Operations using operator. (With and without using scanf()).

- 5. Basic Program on Operator. (Using scanf()).
- a) Program to find and print area, perimeter and volume of geometric objects.
- b) Program to check a number entered by user is Perfect number or not.

6. Program to find maximum and minimum between two numbers given by user using if-else and conditional Operators.

7. Program to swap two numbers.

(4 Lectures)

(4 Lectures)

(4 Lectures)

8. Program to print square and factorial of an entered number using while loop.

9. Program to check a number is Palindrome number or not.

10. Program to check Armstrong number.

11. Program to check and generate prime numbers up to n.

12. Program to find GCD of two entered numbers.

13. Program to find maximum and minimum from n entered numbers.

14. Program to print alternate numbers from n entered numbers.

15. Program to search an element in an Array using linear and binary search.

16. Program to print entered numbers in ascending order using sorting.

17. Program to print addition, subtraction and multiplication of Matrices.

18. Program to find length of string. (With and without using library function).

19. Programs demonstrating use of Structures, Arrays of Structures and Structure containing arrays.

20. Programs demonstrating use of pointers to integers, floats, char, strings, structures and arrays.

BTES106/206 Basic Electrical and Electronics Engineering

Course Objectives:

- 1. To know and apply basic ideas and principles of electrical engineering.
- 2. To Identify protection equipment and energy storage devices.

3. To differentiate electrical and electronics domains and explain the operation of diodes and transistors.

- 4. To acquire knowledge of digital electronics
- 5. To design simple combinational and sequential logic circuits.

Course Outcomes:

Students will be able to:

- 1. Apply basic ideas and principles of electrical engineering.
- 2. Identify protection equipment and energy storage devices.

3. Differentiate electrical and electronics domains and explain the operation of diodes and transistors.

- 4. Acquire knowledge of digital electronics
- 5. Design simple combinational and sequential logic circuits.

Unit 1: Elementary Electrical Concepts:

Fundamental of Electrical system Potential difference, Ohm's law, Effect of temperature on resister, resistance temperature coefficient, Electrical wiring system: Study of different wire gauges and their applications in domestic and industry. Energy Resources and Utilization: Conventional and nonconventional energy resources; Introduction to electrical energy generation from different resources, transmission, distribution and utilization, Advantages & Disadvantages of AC & DC transmission. Concept of Supply Demand, Power Factor, Need of unityfactor.

Unit 2: Measurement of Electrical Quantities:

[07 Hours] Measurement of Voltage, Current, and Power; Measurement of 3 phase power; Study of Energy meters. Study of Electrical Storage devices: Batteries such as Nickel-cadmium (NiCd), Lithium- ion (Li-ion), Lithium Polymer (Li-pol.) batteries. Study of circuit breakers & Actuators (MCB & MPCB, Power Contactors & Aux contactors, Electro- Mechanical & Solid state Relays)

Unit 3: Diodes and Circuits:

The P-N Junction Diode, V-I characteristics, Diode as Rectifier, specifications of Rectifier Diodes, Half Wave, Full wave, Bridge rectifiers, Equations for IDCVDC VRMS, IRMS, Efficiency and Ripple Factor for each configuration. Filters: Capacitor Filter, Choke Input Filter, Capacitor InputFilter(Π Filter), Zener Diode, Characteristics, Specifications, Zener Voltage Regulator, Types of Diodes: LED, Photodiode

Unit 4: Semiconductor Devices and Applications:

Transistors: Introduction, Classification, CE, CB, and CC configurations, α , β , concept of gain and bandwidth. Operation of BJT in cut-off, saturation and active regions (DC analysis). BJT as an amplifier, biasing techniques of BJT, BJT as a switch.

Introduction to Digital Electronics: Number System, Basic logic Gates, Universal Gates, Boolean Postulates, De-Morgan Theorems

[07 Hours]

[07 Hours]

[07 Hours]

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Reference/Text Books:

- 1. V. N. Mittal and Arvind Mittal, Basic Electrical Engineering, McGraw-HillPublication.
- 2 Brijesh Iyer and S. L. Nalbalwar, A Text book of Basic Electronics, Synergy Knowledgeware Mumbai, 2017.ISBN:978-93-8335-246-3
- 3. Vincent DelToro, Electrical engineering Fundamentals, PHI Publication, 2nd Edition, 2011.
- 4. Boylstad, Electronics Devices and Circuits Theory, PearsonEducation.
- 5. Edward Hughes, Electrical Technology, PearsonEducation.
- 6 D. P. Kothari and Nagrath, Theory and Problems in Electrical Engineering, PHI Publication, 2011.
- 7. B. L. Theraja, Basic Electronics, S. Chand Limited, 2007.
- 8 Millman Halkias, Integrated Electronics-Analog and Digital Circuits and Systems, McGraw-Hill Publication, 2000.
- 9. Donald Neaman, Electronic Circuit Analysis and Design, McGraw-Hill Publication, 3rd Edition.
- 10. Donald Neaman, Electronic Circuit Analysis and Design, McGraw-Hill Publication, 3rd Edition.
- 11. Printed Circuit Boards Design & Technology, WalterC. Bosshart, McGraw-Hill Publication.

Note: Students are advised to use internet resources whenever required

BTES206L	Workshop	Practice
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Teaching Scheme:	Examination Scheme:
Practical: 4 hrs/batch	Internal Assessment: 60 Marks External Exam: 40 Marks

Instruction to Students:

Each student is required to maintain a "workshop diary" consisting of drawing / sketches of the jobsand a brief description of tools, equipment, and procedure used for doing the job.

List of Practical: (any six)

- 1. Wood sizing exercises in planning, marking, sawing, chiseling and grooving to make half lap joint and cross lapjoint.
- 2. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding, drilling and tapping on M. S.plates.
- 3. A job on use of plumbing tools and preparation of plumbing line involving fixing of water tap and use of elbow, tee, union and coupling, etc.
- 4. Making a small parts using GI sheet involving development, marking, cutting, bending, brazing and soldering operations- i)Tray ii) Funnel and similararticles.
- 5. Exercise in Arc welding (MMAW) to make a square buttjoint.
- 6. Exercise in Resistance (Spot) welding to make a lap joint.
- 7. Ajobusing power operated tools related to sheet metal work, Welding, Fitting, Plumbing, Carpentry and patternmaking.
- 8. A job on turning of a Mild Steel cylindrical job using center lathe.

Contents:

a) **Carpentry:** Technical Terms related to wood working, Types of wood, Joining materials, Types of joints - Mortise and Tenon, Dovetail, Half Lap, etc., Methods of preparation and applications, Wood working lathe, safety precautions.

b) **Welding:** Arc welding - welding joints, edge preparation, welding tools and equipment, Gas welding - types of flames, tools and equipment, Resistance welding - Spot welding, joint preparation, tools and equipment, safety precautions.

c) **Fitting and Plumbing:** Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation, Different types of pipes, joints, taps, fixtures and accessories used in plumbing, safetyprecautions.

d) **Sheet Metal Work:** Simple development and cutting, bending, Beading, Flanging, Lancing and shearing of sheet metal, Sheet metal machines - Bending Machine, Guillotine shear, Sheet metal joints, Fluxes and their use.

e) **Machine shop**: Lathe machine, types of lathes, major parts, cutting tool, turning operations, safety precautions

Reference/Text Books:

1. K. C. John, Mechanical Workshop Practice, Prentice Hall Publication, New Delhi, 2010. Hazra

and Chaudhary, Workshop Technology-I, Media promoters & Publisher private limited.