VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

Sponsored by
VASAVI ACADEMY OF EDUCATION
Hyderabad

SYLLABI UNDER CBCS FOR
B.E I & II SEMESTERS OF MECHANICAL ENGINEERING
(R-21)
WITH EFFECT FROM 2021-22
(For the students admitted in 2021-22)

DEPARTMENT OF MECHANICAL ENGINEERING

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

SCHEME OF INSTRUCTION AND EXAMINATION (R-21)

B.E. – MECH : FIRST SEMESTER (2021-2022)

Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			
		Hours per Week			Duration in Hrs	Maximum Marks		Credits
		L	T	P/D		SEE	CIE	
THEORY								
U21BS110MA	Calculus	3		-	3	60	40	3
U21BS020CH	Applied Chemistry	3	-	-	3	60	40	3
U21ES010CE	Basic Engineering Mechanics	3	-	-	3	60	40	3
U21PC110ME	Materials Engineering	3	-	-	3	60	40	3
U21ES120CE	Engineering Drawing-I	1	-	2	3	60	40	2
U21HS020EH	Human Values and Professional Ethics-I	1	-	-	2	40	30	1
U21MC010ME	Introduction to Entrepreneurship	1	-	-	2	40	30	0
PRACTICALS								
U21BS011CH	Chemistry Lab	-	-	2	3	50	30	1
U21ES111ME	Engineering Workshop-I	-	-	2	3	50	30	1
U21PC111ME	Materials Engineering Lab	-	-	2	3	50	30	1
TOTAL		15	-	8	-	530	350	18
GRAND TOTAL		23			-	880		18
Left over hours allotted to Sports / Library / PDC / Mentor Interaction / CC / RC / TC / CCA / ECA								

The table header row "B.E (MECH) I Semester" spans the top of the table.

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mathematics

CALCULUS
SYLLABUS FOR B.E.I-SEMESTER

L:T:P(Hrs/week):3+1:0:0	SEE Marks:60	Course Code: **U21BS110ME**
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE The objective of the course is to	**COURSE OUTCOMES** On completion of the course, students will be able to
1. **Understand** The concepts of curvature, radius of curvature, evolutes and to expand functions using Taylor's series.	1. **Compute** radius of curvature, evolute of a given curve and also to expand given function using Taylor's series.
2. **Acquire** knowledge of partial derivatives, and expand functions using Taylor's series functions of two real variables and, maxima-minima.	2. **Expand** the given function in terms of Taylor's series and find Maxima and minima of functions of several variables also using Lagrange's method of multipliers.
3. **Study** the concepts of vector differentiation, Gradient, Divergence and Curl.	3. **Use** gradient to evaluate directional derivatives and conservative vector field.
4. **Learn** how to evaluate double and triple integrals, using change of order of integration and apply vector integration to transformation theorems	4. **Apply** concepts of multiple integrals to evaluate area and volume and vector integration to transformation.
5. **Identify** convergence of infinite series using various tests.	5. **Apply** an appropriate test to check the nature of the infinite series.

UNIT- I (10 classes)
DIFFERENTIAL CALCULUS
Taylor's Series – Maclaurin's Series- Curvature- Radius of Curvature – Centre of Curvature –Evolutes. (Cartesian and Parametric co-ordinates)

UNIT –II (12 classes)
FUNCTIONS OF SEVERAL REAL VARIABLES
Limits- Continuity -Partial Derivatives-Higher Order Partial Derivatives- Total Derivates - Derivatives of Composite and implicit functions - Taylor's

series of functions of two variables - Maxima and Minima of functions of two variables - Lagrange's Method of multipliers.

UNIT – III (08 classes)
VECTOR DIFFERENTIAL CALCULUS

Scalar and Vector point functions -Vector Differentiation-Level Surfaces-Gradient of a scalar point function- Normal to a level surface- Directional Derivative – Divergence and Curl of a Vector field-Conservative vector field.

UNIT – IV (12 classes)
MULTIPLE INTEGRALS: Double and Triple integrals (Cartesian) - Change of order of integration (Cartesian Coordinates).

VECTOR INTEGRATION: Line, Surface and Volume integrals- Green's Theorem – Gauss Divergence theorem - Stokes's Theorem. (all theorems without proof). Solenoidal and Irrotational vectors.

UNIT-V (08 classes)
INFINITE SERIES

Definition of Sequences- Series – Convergence and Divergence- Series of positive terms-Geometric series- p-series test - Comparison tests - D'Alemberts Ratio Test – Cauchy's root test - Alternating Series – Leibnitz test – Absolute and Conditional convergence.

Text Books:
1. Advanced Engineering Mathematics, Third Edition, R. K. Jain and S. R. K. Iyengar, Narosa Publishing House.
2. Higher Engineering Mathematics, B. S. Grewal 40th. Edition, Khanna Publishers.

Reference Books:
1. Advanced Engineering Mathematics 8th Edition by Erwin Kreyszig , John Wiley & Sons.
2. Differential Calculus by Shanti Narayan S. Chand & Co
3. Vector Calculus – Schaum's outline series.

Online Resources :
1. **http://mathworld.wolfram.com/topics**
2. **http://www.nptel.ac.in/course.php**
3. **https://www.coursera.org/in**

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:		30
2	No. of Assignments:	03	Max. Marks for each Assignment:		05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:		05

Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mathematics

APPLIED CHEMISTRY
SYLLABUS FOR B.E.I-SEMESTER

Instruction : 3+1Hrs / week	SEE Marks: 60	Course Code: U21BS020CH
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hours

LEARNING OBJECTIVES:	LEARNING OUTCOMES
The course will enable the students to:	**At the end of the course students should be able to:**
1. Study types of conductance, variation of electrode potential and EMF and to acquaint with applications of Galvanic Cell. 2. Classify and compare various types of batteries and fuel cells. 3. Get acquainted with different types of polymers and their applications. 4. Emphasize upon the quantity and quality of fossil fuels and need for bio- diesel 5. Describe the requirements of water for domestic and industrial uses and the behavior of composition of heterogeneous equilibrium systems	1. Construct a galvanic cell and calculate its EMF and pH wherever applicable. 2. Describe the construction, functioning and applications of the selected primary, secondary batteries and fuel cells. 3. Categorize the polymers and synthesis of a few polymers along with their applications. 4. Rate the fuels and suggest methods for enhancement of the quality of fuels for the required output. 5. Suggest appropriate treatment methods of water to make it fit for domestic and industrial applications and apply the principle of phase rule to heterogeneous equilibria.

CO-PO MAPPING FOR APPLIED CHEMISTRY											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	-	-	-	-	-	-	-	-	-	1
2	3	2	-	-	-	-	2	-	-	-	-	2
3	3	2	-	-	-	-	2	-	-	-	-	2
4	3	2	-	-	-	-	2	-	-	-	-	2
5	3	2	-	-	-	-	2	-	-	-	-	2

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UNIT-I: ELECTROCHEMISTRY (10)

Introduction, conductance, types of conductance- specific, equivalent, molar conductance and their interrelationship- numericals. Principle and applications of conductometric titrations- strong acid *vs* strong base, week acid *vs* strong base and mixture of acids *vs* strong base.

Cells- electrolytic and electrochemical cells. IUPAC convention of cell notation, cell reaction, concept of electrode potential, electro motive force (EMF). Electrochemical series – applications, Nernst equation-derivation, applications and numericals. Types of electrodes- construction and working of calomel electrode (CE), quinhydrone electrode and glass electrode (GE). Determination of pH using glass electrode and quinhydrone electrode. Principle and Applications of potentiometry- acid base and redox reaction (Fe(II) Vs $KMnO_4$).

UNIT-II: BATTERY TECHNOLOGY (9)

Introduction- definition of cell and battery – Types of cells (reversible and irreversible cells). Battery characteristics: free energy change, electromotive force of battery, power density, energy density- numericals.

Primary batteries: Construction and electrochemistry of $Zn-Ag_2O$ battery and lithium-V_2O_5 battery.

Secondary batteries: Construction and working of lead-acid, Ni-Cd and lithium ion battery – advantages, limitations and applications.

Fuel cells: Concept, types of fuel cells and merits. Construction, working and applications of methanol-oxygen fuel cell and phosphoric acid fuel cell.

UNIT-III: POLYMER CHEMISTRY (11)

Introduction, degree of polymerization, functionality of monomers and its effect on the structure of polymers. Classification of polymers-a) homo and co-polymers b) homo chain and hetero chain polymers. c) plastics, elastomers, fibers and resins.

Types of Polymerization - Addition and condensation polymerization.

Glass transition temperature (Tg), factors affecting Tg.

Molecular weight- number average and weight average molecular weight, numericals.

Plastics: Thermo plastics and thermosets - preparation, properties and applications of a) Aramid (Kevlar) b) Poly styrene(PS)

Elastomers: Natural rubber- structure – chemistry of vulcanization and advantages.

Artificial rubbers: Preparation, properties and uses of Buna-S and Buna-N.

Biodegradable polymers: Concept, preparation and uses of ploy lactic acid.

Conducting polymers: Definition- classification, mechanism of conduction in (p-doped and n- doped) polyacetylene and applications.

UNIT-IV-CHEMICAL FUELS (9)
Fuels: Introduction, classification, requisites of a good fuel. Calorific value (CV)-HCV and LCV. Calculation of CV using Dulong's formula, numericals. Chemistry of combustion - numericals on weight- volume and weight-weight methods.
Solid Fuels: Coal: Proximate and ultimate analysis of coal and their significance.
Liquid Fuels: Composition and CV of gasoline, cracking: Fixed bed catalytic cracking method. Knocking and its significance, octane number, enhancement of quality of gasoline by reforming and anti- knock agents. Leaded and unleaded petrol, power alcohol. Catalytic converters and their role in reducing the toxicity of automobile exhaust emissions. Composition and CV of diesel oil, cetane number.
Bio-diesel: Source, chemistry of transesterification and advantages of bio diesel.

UNIT-V: WATER TECHNOLOGY AND PHASE RULE (9)
Hardness of water- types. Calculation of degree of hardness of water- numericals. Determination of hardness of water by EDTA method - numericals. Alkalinity of water and its determination-Numericals. Boiler troubles- scales and sludges formation and prevention-Calgon conditioning. Desalination of water by Reverse Osmosis. Specifications of potable water. Water treatment for drinking purpose sterilization by chlorination- concept of Break Point Chlorination.

Phase rule- Explanation of terms involved, one component system: Water system, condensed phase rule, two component systems: Lead-Silver (Pb-Ag) system, Eutectics and their applications in safety fuses and solders.

Learning Resources:
Text Books:
1. PC Jain, M Jain Engineering Chemistry, Dhanapathi Rai and sons (16th edition), New Delhi.
2. O.G. PALANNA, Engineering Chemistry, TMH Edition.

Reference books:
1. Sashi Chawla, Text book of Engineering Chemistry, Dhanapathi Rai &sons, New Delhi.
2. Wiley Engineering chemistry, Wiley India pvt Ltd, II edition.

3. Chemistry in engineering and technology by J.C. Kuriacose and Rajaram.
4. University chemistry, by B. H. Mahan
5. Physical Chemistry, by P. W. Atkins
6. S. S. Dara, S Chand and sons, Engineering Chemistry, New Delhi.
7. Puri, Sharma and Pathania Principles of physical chemistry, Vishal Publishing Co.
8. Polymer chemistry by Gowariker

Online Resources:
1. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
2. NPTEL Polymer Chemistry Course, D. Dhara, IIT Kharagpur.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
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Department of Civil Engineering

BASIC ENGINEERING MECHANICS
SYLLABUS FOR B.E.I-SEMESTER

L : T : P(Hrs./week):3 : 0 : 0	SEE Marks:60	Course Code: U21ES010CE
Credits: 3	CIE Marks:40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	At the end of the course, students will be able to:
1. Explain the resolution of a system of forces (coplanar, spatial, concurrent, non-concurrent) and compute their resultant. 2. Solve particle equilibrium problem using equation of equilibrium 3. Determine forces in the members of a truss 4. Perform analysis of bodies lying on rough surfaces. 5. Locate the centroid of a body and also compute the area moment of inertia of standard and composite sections.	1. Determine resultant of forces acting on a body. 2. Analyse equilibrium of a body subjected to a system of forces. 3. Perform analysis of trusses using method of joints and method of sections. 4. Solve problem of bodies subjected to friction. 5. Find the location of centroid and calculate moment of inertia and polar moment of inertia of a given section.

UNIT-I: Force Systems: Rectangular components, moment, couple and resultant of two dimensional and three dimensional force systems.

UNIT-II: Equilibrium of Force Systems: Free body diagram, Equations of equilibrium, Equilibrium of planar and spatial system.

UNIT-III: Determinate Trusses: Analysis of plane trusses like Warren girder, Pratt truss, Fink truss etc using method of joints and method of sections.

UNIT-IV: Friction: Laws of friction. Application to simple systems, Connected systems and belt friction, Wedge friction.

UNIT-V: Centroid and Moment of Inertia: Centroids of lines, areas and volumes, Moment of inertia of areas, Composite areas, Polar moment of inertia, Radius of gyration.

Learning Resources:
1. Singer F.L "Engineering Mechanics", Harper & Collins, Singapore, 3rd Edition 2011.
2. Timoshenko S.P and Young D.H "Engineering Mechanics", McGraw Hill International Edition, 2017
3. Andrew Pytel., JaanKiusalaas., "Engineering Mechanics", Cengage Learning, 2014.
4. Beer F.P & Johnston E.R Jr. "VectorMechanics for Engineers", TMH, 2019.
5. Hibbeler R.C, "Engineering Mechanics", Pearson Education, 2017.
6. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
7. Basudeb Bhattacharyya., "Engineering Mechanics", Oxford University Press, 2014.
8. Meriam. J. L. and Kraige L.G., "Engineering Mechanics", Volume-I Statics, John Wiley & Sons, 2017.
9. NPTEL Course (www.nptel.ac.in)
10. Virtual labs (www.vlab.co.in)

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests   :   **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

MATERIALS ENGINEERING
SYLLABUS FOR B.E.I-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U21PC110ME**
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE The objective of the course is to	COURSE OUTCOMES On completion of the course, students will be able to
study phase diagrams, heat treatment, crystal defects, loading and failure of metals and alloys.	1 interpret binary phase diagrams of metals and alloys to assess property changes that occur during equilibrium cooling or heating 2 examine property changes in metals and alloys due to different heat treatment processes 3 summarize the relationship between crystal structure, crystal defects and mechanical properties 4 outline the failure behavior of materials under different loading conditions 5 explain properties and applications of alloy steels and non ferrous alloys.

UNIT-I: STRUCTURE OF ALLOYS
Construction and interpretation of Thermal equilibrium diagram of binary nonferrous alloys, Gibb's phase rule, Study of Eutectic, Eutectoid, Peritectic, Peritectoid and monotectic reactions. Lever rule. Iron– Iron Carbide Equilibrium diagram, Study and interpretation.
Plain Carbon Steels: types, properties and applications
Cast Irons: types, properties and applications.

UNIT-II: HEAT TREATMENT
Purpose of heat treatment, Annealing, Normalising, Hardening, Tempering, Construction and interpretation of T.T.T curve. Austempering and Martempering. Case Hardening: Carburising, Nitriding, Carbo–nitriding, Flame Hardening, Induction Hardening, brief introduction of Age Hardening.

UNIT-III: CRYSTAL STRUCTURE & ATOMIC PACKING
Common crystal structure of metals, Calculation of atomic packing factor for simple cubic, BCC, FCC and HCP crystal structures.
Defects in crystals, point, line, surface and volume defects. Mechanisms of plastic deformation: slip and twinning, Effect of dislocations on plastic deformation, Critical resolved shear stress, Hall– Petch equation, cold working and hot working, strain Hardening and Bauschinger effect. Recovery, Recrystallisation, Grain growth and its effect on mechanical properties of metals.

UNIT-IV:
Fracture: Types of fracture in metals, Ductile and brittle fracture, Griffith theory of brittle fracture, modes of fracture, ductile-brittle transition.
Fatigue: Types of fatigue loading, Experimental determination of fatigue strength (RR– Moore Test),S–N Curve, Structure of fatigue fractured specimen, Effect of metallurgical variables on fatigue of metal, Low cycle fatigue, Cumulative fatigue damage, Factors to be considered for the improvement for the fatigue life.
Creep: Creep Test, Creep curve, Creep strength, Creep deformation mechanisms, difference between creep curve and stress-rupture curve.

UNIT-V: ALLOY STEELS AND NON-FERROUS ALLOYS
Effects of alloying elements like Nickel, Chromium, Manganese, Silicon and Tungsten and Titanium. Study about Stainless steels, HSS, Maraging steels, Hadfield steel, Brass, Bronze, Invar, Duralumin and Ti Alloy (Ti– 6Al– 4V) – their composition, properties and applications.
Super alloys:Hastelloy, Inconel- composition, properties and applications.

Learning Resources:
1. V. Raghavan, "Material Science and Engineering", 5th Edition, Prentice Hall of India Ltd., 1994.
2. S.H. Avner, "Introduction to Physical Metallurgy", 2nd Edition, Tata McGraw Hill, 1997.
3. William D. Callister and David G. Rethwisch, "Materials Science and Engineering: An Introduction", 9th Edition, John Wiley and Sons Ltd., 2014
4. OP Khanna, "Metallurgy and Material Science" . S. Chand, New Delhi 2005.
5. E. Dieter, "Mechanical Metallurgy", 3rd Edition, Tata McGraw Hill, 1997.
6. William F Smith, Javad Hashemi, Ravi Prakash, "Material Science and Engineering", 5th Edition, McGraw Hill Education, 2014.
7. Physical Metallurgy Principles - Robert E Reed-Hill and Reza Abbaschian, 4th Edition, Cengage Learning,

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Civil Engineering

ENGINEERING DRAWING-I
SYLLABUS FOR B.E.I-SEMESTER

L : T : P (Hrs./week):1:0:2	SEE Marks:60	Course Code: U21ES120CE
Credits: 2	CIE Marks:40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	At the end of the course, students will be able to:
1. Impart skills of drawing instruments and their use to convey exact and complete information of any object. 2. Explore various scales in Engineering practice 3. Construct engineering curves. 4. Prepare orthographic projections of points, lines, planes and solids	1. Identify the qualities of precision and accuracy. 2. Convey technical information effectively through sketches / drawings. 3. Construct engineering curves with different methods. 4. Develop the conics using different methods, hypocycloidal and involutes. 5. Draw the orthographic projection of points, lines, planes and solids.

UNIT-I: Introduction: Instruments and their uses, lettering, types of lines and dimensioning methods.
Scales: Reduced and Enlarged scales, Representative fraction, Scales: plain, diagonal only.
Regular Polygons: Polygons given the length of side only.

UNIT-II: Engineering curves: Ellipse, Parabola and Hyperbola (Eccentricity method only), Cycloid, Epicycloid, Hypocycloid and Involute.

UNIT-III: Projection of points and straight lines: Orthographic projection, Projection of points placed in different quadrants, Projection of straight lines inclined to one and two reference planes placed in first quadrant only, Traces.

UNIT-IV: Projections of planes: Projection of perpendicular planes, Oblique planes and Traces of planes.

UNIT-V: Projection of solids: Polyhedra, Solids of revolution, Projections of solids in simple position (prisms, pyramids, cylinders and cones), axis inclined to one plane, Axis inclined to both the reference planes, Projection of solids using auxiliary plane method.

Learning Resources:
1. Bhatt N.D. "Elementary Engineering Drawing", Charotar Publishers, 2014.
2. Thomas E French, Charles J Vierck, Robert J. Foster, "Engineering Drawing and Graphic Technology", McGraw Hill Education, 2012.
3. Gill P.S. "Engineering Drawing: Geometrical Drawing", SK Kataria & sons, 2012.
4. Venugopal.K "Engineering Drawing and Graphics Plus Autocad", New Age International (P) Ltd., New Delhi, 2010.
5. Siddiquee A.N "Engineering Drawing with a Primer on Autocad", Prentice hall of India Ltd., New Delhi, 2004.
6. Basanth Agrawal, Agrawal C.M "Engineering Graphics" First Edition, Tata McGraw Hill, 2012
7. BVR Gupta, M Raja Roy, "Engineering Drawing with AutoCad", IK Int Pvt Ltd, 2009
8. NPTEL Course (www.nptel.ac.in)
9. Virtual labs (www.vlab.co.in)

The break-up of CIE: Internal Tests   + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests   :   90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of H&SS

HUMAN VALUES AND PROFESSIONAL ETHICS-I
SYLLABUS FOR B.E.I-SEMESTER

L:T:P(Hrs/week):1:0:0	SEE Marks:40	Course Code: **U21HS020EH**
Credits : 1	CIE Marks:30	Duration of SEE: 02Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to: -	On completion of this course the student will be able to :
1. Get a holistic perspective of value-based education.	1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Grasp the meaning of basic human aspirations vis-a-vis the professional aspirations.	2. Distinguish between Personal and Professional life goals–constantly evolving into better human beings and professionals.
3. Understand professionalism in harmony with self and society.	3. Work out the strategy to actualize a harmonious environment wherever they work.
4. Develop ethical human conduct and professional competence.	4. Distinguish between ethical and unethical practices, and start implementing ethical practices
5. Enrich their interactions with the world around, both professional and personal.	5. Apply ethics and values in their personal and professional interactions.

UNIT-1 HARMONY WITH SELF AND FAMILY
This unit will cover the basic Human Aspirations: Philosophy, purpose & objective of Life

Understanding and living in harmony at various levels-with self, family, society and nature.and the **Ethical and moral values:** which include self-sufficiency, self-determination, self-advocacy, self-competence, self-direction, self-efficacy, self-regulation, self-reliance, and self-responsibility. This also includes Family values involving all the ideas of how you want to live your family life, and they are often passed down from previous generations.

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UNIT-2 PROFESSIONAL VALUES AND BEHAVIOUR
This unit covers the following components
a) **At the level of individual:** as socially and ecologically responsible engineers and technologists.
b) **Team Work: Developing** Credibility and building trust by having open and truthful communication. This includes recognizing the value of time and respecting time of self and others.

UNIT 3 - SOCIAL VALUES
This unit covers inputs on values of service, social justice, dignity and worth of the person, importance of human relationships, integrity, and competence.

UNIT 4 - SPIRITUAL VALUES
This unit covers on developing individual practice and has to do with having a sense of peace and purpose. Spiritual values, namely, benevolence, charity, dignity, forbearance, hope, humility, kindness, love, modesty, peace, perseverance, piety, repentance, righteous, sacredness, sincerity, steadfastness, striving, trusting, truthfulness, unity, and wisdom.

MODE of DELIVERY

● **Questionnaires**	● **Discussions**
● **Quizzes**	● **Skits**
● **Case-studies**	● **Short Movies/documentaries**
● **Observations and practice**	● **Team tasks and individual tasks**
● **Home and classroom assignments**	● **Research based tasks**
	● **Viva**

Relevant Websites, CD's and Documentaries
● https://plato.stanford.edu/
Learning Resources:
learn.talentsprint.com
The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	01	Max. Marks for each Internal Test:	20
2	No. of Assignments:	02	Max. Marks for each Assignment:	05
3	No. of Quizzes:	02	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

INTRODUCTION TO ENTREPRENEURSHIP
SYLLABUS FOR B.E.I-SEMESTER

L:T:P(Hrs/week):1:0:0	SEE Marks:40	Course Code: **U21MC010ME**
Credits : --	CIE Marks:30	Duration of SEE: 02Hours

COURSE OBJECTIVE	COURSE OUTCOMES	
The objective of the course is to	*On completion of the course, students will be able to*	
inspire students develop an entrepreneurial mind-set, educate about the resources and schemes available to start enterprises in India.	1	get awareness about entrepreneurship and potentially become an entrepreneur.
	2	discern the characteristics required to be a successful entrepreneur
	3	know the importance of effective communication.
	4	demonstrate effective sales skills

Unit-I: Sources of new ideas, techniques for generating ideas.
Team formation, how entrepreneurship has changed the country and world, entrepreneurial myths, E-cells and their significance, success story of entrepreneurs, eg: Practo, global entrepreneurs, entrepreneurial journeys, challenges, and successes, characteristics of a Successful Entrepreneur, entrepreneurial styles, introduction to business model.

Unit-II: Importance of effective communication for entrepreneurs, communication barriers, miscommunication, incorrect assumptions about people, importance of listening, design thinking-a problem solving process, sales skills, understanding the customer-centric approach, personal selling techniques, show and tell, elevator pitch, managing risks and learning from failures, women entrepreneurs.

Learning Resources:

1. Bruce R. Barringer and R. Duane Ireland, "Entrepreneurship: successfully launching new ventures", 3rd edition, Pearson Prentice Hall, 2009.

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2. P. Denning and R. Dunham, "The Innovator's Way", MIT Press: Cambridge, Massachusetts, 2010.
3. Arya Kumar, "Entrepreneurship", Pearson Education, Delhi, 2012.
4. Michael H. Morris, D.F.Kuratko, J G Covin, "Corporate Entrepreneurship and Innovation", Cengage learning, New Delhi,2010
5. Peter F. Drucker, "Innovation and Entrepreneurship", Routledge Classics, 2015.
6. Eric Ries, "The Lean Start-up", Currency, 1st edition, 2011.

Web Resources:
7. http://www.learnwise.org

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	01	Max. Marks for each Internal Test:	20
2	No. of Assignments:	01	Max. Marks for each Assignment:	05
3	No. of Quizzes:	01	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Chemistry
CHEMISTRY LAB
SYLLABUS FOR B.E.I-SEMESTER

Instruction : 2 Hrs / week	SEE Marks: 50	Course Code : U21BS011CH
Credits : 1	CIE Marks : 30	Duration of SEE : 3 Hours

LEARNING OBJECTIVES:	**LEARNING OUTCOMES:**
The course will enable the students to:	**At the end of the course, students should be able to:**
1. Describe the quantitative analytical techniques 2. Learn the skills to handle the instruments 3. Apply the theoretical principles in experiments 4. Examine the accuracy	1. Determine the amount of metals in the given solutions. 2. Analyse the hardness, alkalinity and chloride content of a given sample. 3. Estimate the amount of a substance in a given solution by conductometry, potentiometry and pH metry. 4. Use the principle of colorimetry in the estimation of Permanganate / Copper (II) in a given solution.

CO-PO MAPPING FOR CHEMISTRY LAB											
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	-	-	-	-	-	-	2	-	-	1
2	3	2	-	-	-	-	-	-	2	-	-	1
3	3	2	-	-	-	-	-	-	2	-	-	1
4	3	2	-	-	-	-	-	-	2	-	-	1
5	3	-	-	-	-	-	-	-	2	-	-	1

1. Preparation of standard FAS or oxalic acid solution and standardization of $KMnO_4$ or NaOH solution.
2. Estimation of ferrous iron in the given solution by permanganometry.
3. Estimation of chromium in the given solution by standardized FAS.
4. Estimation of copper in brass or given solution by hypo.
5. Estimation of available chlorine in bleaching powder.
6. Estimation of total hardness of given water sample.
7. Estimation of alkalinity of a given sample.

8. Conductometric acid-base titrations -Determination of strength of given acids (HCl *Vs* NaOH and CH_3COOH *Vs* NaOH).
9. Conductometric acid-base titrations- Determination of strength of acids in a given mixture of acids (HCl and CH_3COOH *Vs* NaOH)
10. Determination of strength of a given acid by Potentiometry.
11. Determination of concentration of a given $FeSO_4$ using redox titration by Potentiometry.
12. Determination of strength of a given acid by pH metry.
13. Determination of strength of permanganate or copper in brass solution by Colorimetry.
14. Determination of concentration of a salt by ion exchange method.
15. Synthesis of Aspirin or Phenol formaldehyde resin.

Learning Resources:

Text Books:
1. Sunita rattan, Experimenta in applied chemistry, S K Kataria & Sons (2010)
2. M S Kaurav, Engineering chemistry with laboratory experiments, PHI learning (P) ltd, New Delhi.

Reference Books:
1. G H Jeffery, J Bassett, J Mendham, R C Denney, Vogel's text book of quantitative chemical analysis, Fifth Edition.
2. A text book on experiments and calculation Engg. S.S. Dara.

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
ENGINEERING WORKSHOP-I
SYLLABUS FOR B.E.I-SEMESTER
(Common to Mechanical, Civil & EEE branches)

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code:**U21ES111ME**
Credits :01	CIE Marks:30	Duration of SEE:03Hours

COURSE OBJECTIVES *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 know basic workshop processes, adopt safety practices while working with various tools 2 identify, select and use various marking, measuring, holding, striking and cutting tools & equipments.	1 create models in Carpentry, plumbing, Electrical & Electronics 2 and Sheet metal trades by using the relevant tools. 3 measure and inspect the finished components using suitable measuring instruments. apply basic electrical and electronics engineering knowledge to make simple electrical circuits and check their functionality along with practice in soldering of electronic components.

List of the Experiments:
PLUMBING:
1. Introduction of tools, joints, couplings and valves etc.
2. Pipe thread cutting and making single joint with coupling and tap connection.
3. Water shower connection with reducer coupling

ELECTRICAL & ELECTRONICS:
1. Two lamps in (a) series (b) parallel with 3 pin plug and switches
2. Staircase wiring and Tube light wiring
3. (a) Identification of electronic components
   (b) Soldering practice

CARPENTRY:
1. Half-lap joint
2. Dove-tail joint
3. Bridle joint

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SHEET METAL:
1. Rectangular box
2. Rectangular scoop with handle
3. Making a funnel with soldering

Additional Experiments
1. Plastic Moulding: Injection moulding of plastic spoon (demo)
2. Plumbing: Geyser connection(demo)
3. Electrical & Electronics: LT Distribution with loads (Demo)
4. Carpentry: Wood turning operation (demo)
5. Sheet Metal: Making a T-Joint (Demo).

Learning Resources:
1. Hajra Choudhury S.K., Hajra Choudhury A.K., Nirjar Roy S.K. "Elements of Workshop Technology" Vol-I 2008 & Vol-II 2010 Media Promoters & Publishers Pvt. Limited, Mumbai.
2. Kalpakjian S. and Steven R. Schmid, "Manufacturing Engineering and Technology" 4th Edition, Pearson Education India, 2002.
3. Gowri P., Hariharan and Suresh Babu A., "Manufacturing Technology-I", Pearson Education 2008.
4. P. Kannaiah & K. L. Narayana "Workshop manual" 2nd Ed., Scitech publications (I) Pvt. Ltd., Hyderabad.
5. B.L. Juneja, "Workshop Practice", Cengage Learning India Pvt. Limited, 2014.
6. www.technologystudent.com

The break-up of CIE:

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: **2 Hours**			

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
MATERIALS ENGINEERING LAB
SYLLABUS FOR B.E.I-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: **U21PC111ME**
Credits :01	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVE	COURSE OUTCOMES	
The objective of the course is to	*On completion of the course, students will be able to*	
prepare metallographic samples, observe micro structure for various metals, heat treatment of steel samples and examine micro structures using metal analyzer.	1	illustrate the relationship between microstructure and properties of ferrous alloys.
	2	illustrate the relationship between microstructure and properties of non-ferrous alloys.
	3	examine property changes in steels due to Annealing and Normalising processes.
	4	examine property changes in steels due to Hardening and Tempering processes.
	5	interpret the microstructure using image analyzer.

List of Experiments:
1. Study of General Procedure for Specimen preparation and Metallurgical Microscope.
2. Preparation of Mounted samples with the help of mounting press.
3. Metallographic study and analysis of Low Carbon Steel.
4. Metallographic study and analysis of Medium Carbon Steel.
5. Metallographic study and analysis of High Carbon Steel.
6. Metallographic study and analysis of Gray Cast Iron.
7. Metallographic study and analysis of Spheroidal cast iron.
8. Metallographic study and analysis of α– Brass.
9. Metallographic study and analysis of α– β Brass.
10. Metallographic study and analysis of Bronze.
11. Study of effect on Hardness of plain carbon steel before and after the following Processes: Annealing and Normalizing.
12. Study of effect on Hardness of plain carbon steel before and after the following Processes: Hardening and Tempering.
13. Measurement of hardenability using Jominy End Quench Test.

14. Study of crystal structure and calculation of packing factor of Simple Cubic, BCC, FCC and HCP crystals.
15. To evaluate the grain characteristics of a given ferrous specimen.
16. To evaluate the grain characteristics of a given non-ferrous specimen.

From the above experiments, each student should perform at least 12 (Twelve) experiments.

The break-up of CIE:

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: **2 Hours**			

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-21)
B.E. – MECH : SECOND SEMESTER (2021-2022)

B.E (MECH) II Semester								
Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			
		Hours per Week			Duration in Hrs	Maximum Marks		Credits
		L	T	P/D		SEE	CIE	
THEORY								
U21BS210MA	Differential Equations & & Complex Analysis	3		-	3	60	40	3
U21BS220PH	Engineering Physics	3	-	-	3	60	40	3
U21ES210CE	Engineering Mechanics	3		-	3	60	40	3
U21ES220CE	Engineering Drawing-II	1	-	2	3	60	40	2
U21PC210ME	Thermodynamics	3	-	-	3	60	40	3
U21HS110EH	English Language and Communication	2	-	-	3	60	40	2
U21MC010CE	Environmental Science	2	-	-	3	60	40	0
PRACTICALS								
U21HS111EH	English language and communication skills Lab	-	-	2	3	50	30	1
U21BS011PH	Applied Physics Lab	-	-	2	3	50	30	1
U21ES211ME	Engineering Workshop –II	-	-	2	3	50	30	1
TOTAL		17	-	8	-	570	370	19
GRAND TOTAL		25			940			19
Left over hours allotted to Sports / Library / PDC / Mentor Interaction / CC / RC / TC / CCA / ECA								

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VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mathematics
DIFFERENTIAL EQUATIONS & COMPLEX ANALYSIS
SYLLABUS FOR B.E.II-SEMESTER

LPT : 3+1 :0:0	SEE Marks : 60	Course Code : U21BS210MA
Credits : 3	CIE Marks : 40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to :	*At the end of the course students should be able to:*
1. **Study** the concepts of matrices, Eigen values and Eigen vectors, Diagonalization and canonical form of a quadratic form. 2. **Solve** first order differential equations using elementary techniques and learn its applications. 3. **Use** the various higher order homogeneous and non-homogeneous linear differential equations with constant coefficients to solve it and apply on electrical circuits 4. **Understand** the Analytic functions, conditions and harmonic functions. 5. **Evaluate** a line integral of a function of a complex variable using Cauchy's integral formula, and how to evaluate Taylor's and Laurent Series.	1. **Find** the rank of a given matrix, diagonalizable a given matrix and reduce a quadratic form to canonical form and find its nature. 2. **Identify** the suitable I.F and solve differential equations, model the real time electrical engineering problems viz., RC & LR Circuits into differential equations and solve. 3. **Apply** various higher order Linear Differential equations, to solve LC and LCR circuits. 4. **Apply** the condition(s) for a complex variable function to be analytic and/or harmonic and to construct an Analytic function. 5. **Evaluate** complex integrals by Cauchy's theorem and Cauchy's Integral formula and define singularities of a function and to expand a given function as a Taylor's / Laurent's series.

UNIT – I (12 classes)

MATRICES
Rank of a Matrix- Linearly independence and dependence of Vectors - Characteristic equation- -Eigen values and Eigenvectors - Cayley - Hamilton Theorem (without proof)-   Diagonalization using Similarity Transformation.

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UNIT – II (10 classes)

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER
Exact first order differential equations - Integrating factors- Clairaut's equation -Applications of First Order Differential Equations -Orthogonal trajectories (Cartesian families) – LR and RC Circuits.

UNIT – III (12 classes)

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS
Solutions of Homogeneous and Non Homogeneous linear equations with constant coefficients- Method of Variation of Parameters –Applications of linear differential equations to LCR circuits

UNIT – IV (08 classes)

DIFFERENTIATION OF COMPLEX FUNCTION
Limits and Continuity of function - Differentiability and Analyticity - Necessary & Sufficient Condition for a Function to be Analytic - Milne-Thompson's method -Harmonic Functions.

UNIT – V (10 classes)

INTEGRATION OF COMPLEX FUNCTION
Complex Integration- Cauchy's Theorem - Extension of Cauchy's Theorem for multiply connected regions- Cauchy's Integral Formula - Power series - Taylor's Series - Laurent's Series (without proofs) –Poles and Residues.

Text Books:
1. Advanced Engineering Mathematics 3rd Edition, R.K.Jain & S.R.K.Iyengar, Narosa
    Publishing House.
2. Higher Engineering Mathematics 40th Edition Dr. B.S Grewal, Khanna Publishers.
3. A Text book of Engineering Mathematics, N.P.Bali & Manish Goyal, Laxmi
    Publications.

Reference Books:
1 Advanced Engineering Mathematics, by Wylie & Barrett, Tata Mc Graw Hill, New Delhi.
2 Advanced Engineering Mathematics, 8th Edition by Erwin Kreyszig , John Wiley & Sons, Inc.

3 Complex Variables and applications, J.W.Brown and R.V.Churchill, 7th Edition, Tata Mc Graw Hill,2004.

Online Resources :
1 **http://mathworld.wolfram.com/topics**
2 **http://www.nptel.ac.in/course.php**
3 **https://www.coursera.org/in**
4 **http://davidbau.com**

The break-up of CIE : Internal Tests   + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
ENGINEERING PHYSICS
SYLLABUS FOR B.E.II-SEMESTER

LPT : 3 :0:0	SEE Marks : 60	Course Code: U21BS220PH
Credits : 3	CIE Marks : 40	Duration of SEE: 03Hours

CO code	Course Objectives	Course Outcomes	Highest BTL
BS220PH.1	Explain mathematical formulations of waves and oscillations	Interpret behavior of mechanical oscillators with and without damping	2
BS220PH.2	State principles of interference, diffraction and polarization of light	Outline the principles of wave optics and their applications	1
BS220PH.3	Comprehend lasing action and relate use of lasers in optical fiber communications.	Compare different types of lasers and illustrate use of light sources in optical fiber communication	3
BS220PH.4	Describe good acoustics required for a hall	Explain production of ultrasonics and summarize good building acoustics	2
BS220PH.5	Summarize the principles of liquefaction of gasses	Describe liquefaction of gases and their significant applications	2

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	3	-	-	-	-	-	-	-	1	-	1	1
CO2	3	3	-	-	-	-	-	-	-	1	-	1	1
CO3	2	2	-	-	-	-	-	-	-	1	-	1	1
CO4	3	2	-	-	-	-	-	-	-	1	-	1	1
CO5	2	2	-	-	-	-	-	-	-	1	-	2	1

UNIT-I: OSCILLATIONS (10 hours)
Definition of SHM, equation of motion and it solution to simple harmonic oscillator, energy of simple harmonic oscillator, equation of motion and it solution to damped harmonic oscillator, logarithmic decrement, energy of damped oscillator, relaxation time, equation of motion and it

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solution to forced harmonic oscillator, Resonance, Q-factor, sharpness, electromechanical analogy.

UNIT-II: WAVE OPTICS (10 hours)

Interference: superposition principle, coherence, conditions for interference, interference due to thin parallel film, Newton's rings, and its applications.

Diffraction: Phenomenon of diffraction of light, differences between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to a single slit- diffraction due to N-slits (plane transmission grating)-Rayleigh criterion for limit of resolution, resolving power.

Polarization: Polarization of light, types of polarized light, Brewster law, Malus law, double refraction, construction and working of Nicol's Prism, action of Polarizer and analyzer, Quarter wave and Half wave plates.

UNIT-III: LASERS AND OPTICAL FIBRES (10 hours)

Lasers: induced absorption, spontaneous and stimulated emissions, Properties of laser light, population inversion, meta-stable states, pumping mechanisms, components of laser, construction and working of Ruby laser, He-Nelaser, and CO_2 lasers, advantages and applications of lasers.

Optical Fibers: Introduction, total internal reflection, propagation of light in optical fibre, numerical aperture, acceptance angle, types of optical fibres, evanescent field, light sources for optical fibers, various signal losses in optical fibers: Attenuation-Absorption, Scattering, bending, alignment losses, Signal distortion: intermodal and intra model losses. Block diagram of optical communication system, advantages and application of optical fibers.

UNIT-IV: ACOUSTICS (10 hours)

Acoustics: sound, classification of sound: musical sounds and noise, Characteristics of musical sound-pitch, loudness, timbre, sound intensity, sound pressure levels, phon, Sone, reverberation time, Sabine's formula, sound absorbent materials, absorption coefficient, conditions for good acoustics of a building-acoustic quieting: effects and remedies

Ultrasonics: propertiesofultrasonics,typesofultrasonicwaves, productionofultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics by piezoelectric, Kundt's tube, flame test, thermal detector, applications of ultrasonics: SONAR, cavitation (cleaning), drilling,sonogram

UNIT-V: LOW TEMPERATURE PHYSICS (10 hours)

Introduction to low temperature Physics- Porous plug experiment: Joule Thomson effect, Theory of porous plug experiment- J-K effect for a Van der Waal's gas, J-K effect for real gas, Inversion temperature, Boyle temperature, critical temperature and relationship between them. Regenerative cooling and cascade process, Liquefaction of air by Linde Process, Liquefaction of helium, Properties of cryogenic helium, adiabatic demagnetization, Applications of cryogenicliquids.

Learning Resources:

1. J Walker, D., Halliday and R Resnick, Principles of Physics, 10th edition, Wiley, 2016,
2. Jewett and Serway, Physics for Scientists and Engineering, 7th edition, 2012.
3. A. P. French, Vibration's and Waves, CRC Press,2003
4. M.N. Avadhanulu and P.G. Kshirsagar and TVS Arun Murthy, A Textbook Engineering Physics, 11[th]Edition, S. Chand,2018.
5. Senior, Optical Fiber Communications: Principles and Practice, 3e: Pearson,2010
6. B.K. Pandey, S. Chaturvedi, Engineering Physics, Cengage Learning,

2012

The break-up of CIE : Internal Tests   + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
ENGINEERING MECHANICS
SYLLABUS FOR B.E.II-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks: 60	Course Code: U21ES210CE
Credits: 3	CIE Marks: 40	Duration of SEE: 3Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	At the end of the course, students will be able to:
1. Determine the mass moment of inertia and product of inertia of standard and composite sections. 2. Understand the concepts of dynamics and its principles. 3. Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies. 4. Impart the concepts of work-energy method and its applications to translation, rotation and plane motion. 5. Impart the concept of impulse momentum relation	1. Compute mass moment of inertia and product of inertia of standard and composite section. 2. Distinguish between statics and dynamics and differentiate between kinematics and kinetics. 3. Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion. 4. Solve problems using work energy equations for translation, fixed axis rotation and plane motion. 5. Solve problems using impulse momentum equation

UNIT-I: Product of Inertia & Mass moment of Inertia: Product of inertia, Mass moment of inertia for solid and composite bodies, Radius of gyration.

UNIT–II: Kinematics: Rectilinear motion, Curvilinear motion, Projectile motion, Velocity and acceleration, Types of rigid body motion, and its analysis in a plane.

UNIT-III: Kinetics: Analysis as a particle, Analysis as a rigid body in translation, Fixed axis rotation. Rolling bodies, Plane motion.

UNIT –IV: Work Energy: Principles of work-energy and its application to translation, Fixed axis rotation and plane motion.

UNIT-V: Impulse and momentum: Introduction, linear impulse-momentum, principle of conservation of linear momentum, loss of kinetic energy.

arning Resources:
1. Singer F.L "Engineering Mechanics", Harper & Collins, Singapore, 3rd Edition 2011.
2. Timoshenko S.P and Young D.H., J V Rao, Sukumar Patil, "Engineering Mechanics (SI Units)", McGraw Hill, 5th edition.2013.
3. Andrew Pytel, JaanKiusalaas, "Engineering Mechanics", Cengage Learning, 4th edition, 2016.
4. Beer F.P & Johnston E.R Jr. "VectorMechanics for Engineers", TMH, 12th edition, 2019.
5. Hibbeler R.C Sharma D P & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2012.
6. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
7. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press,2nd edition, 2014.
8. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 4th edition, 2008.
9. NPTEL Course (www.nptel.ac.in)
10. Virtual labs (www.vlab.co.in)

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
ENGINEERING DRAWING-II
SYLLABUS FOR B.E.II-SEMESTER

L:T:P (Hrs./week): 1:0:2	SEE Marks: 60	Course Code: U21ES220CE
Credits: 2	CIE Marks: 40	Duration of SEE: 3Hrs

Course Objectives	Course Outcomes
Objectives of this course are to:	At the end of the course, students will be able to:
1. Explain the principles involved in Section of simple solids 2. Develop surfaces of simple solids 3. Explain intersection of cylinder with cylinder and cylinder with cone 4. Differentiate between isometric view and isometric projection 5. Draw orthographic views from pictorial views	1. Draw sectional views of simple solids 2. Develop the lateral surfaces of simple solids 3. Prepare orthographic views of intersection of solids. 4. Visualize isometric view of simple planes, solids and combined solids 5. Construct orthographic views of simple objects from their pictorial views

UNIT-I: Sections of Solids: True shape of sections, sections of prisms, pyramids, cylinders and cones.

UNIT-II: Development of Surfaces: Basic concepts of development of surfaces, Methods of development – Parallel line development and radial line development, Development of prisms, pyramids, Cylinders and cones.

UNIT-III: Intersection of Surfaces: Intersection of cylinder and cylinder, cylinder and cone.

UNIT–IV: Isometric Projections: Isometric scale, Isometric projections of prisms, pyramids, cylinders, cones, spheres, and combinations of two or three solids.

UNIT-V: Conversion of Isometric Views to Ortho-graphic views:
Drawing orthographic views from Isometric views for simple objects.

Learning Resources:

1. Bhatt N.D. "Elementary Engineering Drawing", Charotar Publishers, 2014.
2. Thomas E French, Charles J Vierck, Robert J. Foster, "Engineering Drawing and Graphic Technology", McGraw Hill Education, 2012.
3. Gill P.S. "Engineering Drawing: Geometrical Drawing", SK Kataria & sons, 2012.
4. Venugopal.K "Engineering Drawing and Graphics Plus Autocad", New Age International (P) Ltd., New Delhi, 2010.
5. Siddiquee A.N "Engineering Drawing with a Primer on Autocad", Prentice hall of India Ltd., New Delhi, 2004.
6. Basanth Agrawal, Agrawal C.M "Engineering Graphics" First Edition, Tata McGraw Hill, 2012
7. BVR Gupta, M Raja Roy, "Engineering Drawing with AutoCAD", IK Int Pvt Ltd, 2009.
8. NPTEL Course (www.nptel.ac.in)
9. Virtual labs (www.vlab.co.in)

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests   :   90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
THERMODYNAMICS
SYLLABUS FOR B.E.II-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U21PC210ME**
Credits :03	CIE Marks:40	Duration of SEE:03Hours

Course Objectives	Course Outcomes
Thermodynamics deals with energy, matter and the laws governing their interactions. It is useful in the design of processes, devices and systems involving effective utilization of energy and matter. The course emphasizes on the fundamentals and concepts of the laws of thermodynamics as applied to control mass and control volume systems, to various thermal systems working on air and vapour power cycles.	On completion of the course the student will be able to: 1. Apply the basic knowledge of thermodynamics to determine the state properties. 2. Estimate the energy transfers by applying the first-law of thermodynamics to closed system (control mass) and open system (control volume). 3. Analyze the problems on heat engines, refrigerators and entropy by applying the second-law of thermodynamics to various systems and processes. 4. Estimate the thermodynamic properties of pure substances by using the property tables and Mollier Diagram 5. Evaluate the performance of air standard cycles and Rankine vapour power cycle that form the basis for various thermal prime movers.

UNIT– I: Basics of Thermodynamics
Concepts of system: control mass and control volume; Macroscopic and Microscopic approaches; concept of Continuum; thermodynamic properties, thermodynamic state, process and cycle, , quasi-static process, thermodynamic equilibrium; definition of energy, pressure and temperature; ideal gas; the Zeroth law of thermodynamics; temperature scales; problem solving.

UNIT – II: First-law of Thermodynamics
Definition of Work and Heat; Joule's experiment; first-law to a control mass undergoing a process; Energy as property of system; internal energy, enthalpy and specific heat; P-v and T-v diagrams; conservation of mass and energy to a control volume; steady-state process, steady flow energy equation (SFEE): applications; PMM-1; first-law rate equation to a control mass and control volume; problem solving.

UNIT – III: Second-law of Thermodynamics

Reversible and irreversible processes; heat engine, heat pump and refrigerator; Carnot cycle; performance parameters (efficiency and COP); Kelvin–Planck and Clausius statements; PMM-2, Clausius inequalities; entropy as a property; entropy change in a process, T–s diagram; principle of entropy increase; Definitions of Exergy and Anergy; problem solving.

UNIT – IV: Properties of Pure Substances

Definition of Pure substance and phase, Concept of phase change, vapour-liquid-solid phase equilibrium of pure substances; P-T, P-v, T-s, h-s and T-v diagrams; estimation of properties using thermodynamic tables and Mollier chart; problem solving.

UNIT– V: Power cycles

Air standard cycles: Otto, Diesel, Dual and Brayton cycles; work done, air standard efficiency of gas power cycles; simple Rankine cycle; problem solving.

Learning Resources:

1. R.E. Sonntag, C. Borgnakke & G.J. Van Wylen, "Fundamentals of Thermodynamics", 6th edition, John Wiley Publications, 2015
2. P.K. Nag, "Engineering Thermodynamics", 5th edition, McGraw Hill Education, 2014.
3. Y. Cengel & M. Boles, "Thermodynamics an Engineering approach", 7th Edition, McGraw Hill, , 2011.
4. E Rathakrishnan, "Fundamentals of Engineering Thermodynamics", 2nd edition, PHI, 2013.
5. ISI Steam Tables in SI units, Indian Standards Institution, New Delhi, SP:26-1983.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **90 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
ENGLISH LANGUAGE AND COMMUNICATION
SYLLABUS FOR B.E.II-SEMESTER

L:T:P(Hrs/week):2:0:0	SEE Marks:60	Course Code: **U21HS110EH**
Credits :02	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the learners to:	**At the end of the course the learners will be able to: -**
1. Understand the role and importance of communications skills.	1. Communicate effectively, appropriately and ethically in both professional & personal spheres.
2. Develop the habit of listening effectively to various speakers and lectures.	2. Listen for gist and make inferences from various speeches and converse intelligibly in various contexts.
3. Develop reading strategies in order to understand various types of texts	3. Evaluate and infer various text types.
4. Understand the various features and formats of writing.	4. Compose letters and essays, coherently and cohesively using discourse marks.
5. Comprehend grammar constructs and vocabulary used in different contexts.	5. Construct grammatically correct sentences using adequate vocabulary.

UNIT-11.0 Effective communication and Interpersonal skills

1.1 Role and Importance of Language and Communication; Functions of communication; Process of Communication; Types of Communication; Styles of Communication; Channels of Communication; Barriers in Communication and how to overcome them.

1.2 Politeness theory.

1.3 Johari Window

1.4 Team building skills and team work

1.5 Persuasion techniques

UNIT-2   2.0 Listening and Speaking skills

2.1 Importance of listening for effective communication; Elements of Active listening.

2.2 Speaking skills: -Speaking strategies; Telephone etiquette.

UNIT-3   3.0Reading and Writing skills

3.1 Sub-skills of Reading; Understanding the functions of different texts, Reading Comprehension-Global and Local.

3.2Featuresof Writing: -

Organizing principles of writing paragraphs-Coherence, Cohesion & Unity; Use of appropriate linkers. Paraphrasing and Summarizing skills.

3.3Written Communication:
- Email etiquette
- Request letters
- Creative writing- Pictionary, Taglines, Script Writing

UNIT-44.0 Vocabulary Building and Grammar

4.1   VocabularyBuilding:TheconceptofWordFormation-PrefixesandSuffixes; Synonyms, Antonyms, and Standard abbreviations. Word origin-Etymology; One-word substitutes; Collocation; Idioms.

4.2 **Functional Grammar**: Articles, Prepositions; Tense and Aspect; Subject- Verb agreement; Connectives; Direct and Indirect Speech; Active-Passive

All these aspects will be taught as common errors.

UNIT-5 5.0Reading for appreciation of literary texts

5.1Prosetext- On Shaking Hands- A G Gardiner.

5.2Poem-What life should be-Patricia A Fleming.

Prescribed textbook for theory:

Technical communication - Principles and Practice (2nd Edition 2014) - Meenakshi Raman and Sangeeta Sharma- Oxford University Press.

Suggested Reading

E.Suresh kumar, P. Sreehari and J. Savithri - Essential English

Reading comprehension - Nuttal.J.C - Orient Blackswan

Sunitha Mishra,C. Murali Krishna, Communication Skills for Engineers, Pearson, 2004.

M. Ashraf Rizvi. Effective Technical Communication. Tata Mcgraw Hill, 2005.

Allen and Waters., How English Works.

Willis Jane., English through English.

Brown, Penelope and Stephen C. Levinson. 1978. Universals in language usage: politeness phenomena: Cambridge University Press

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
ENVIRONMENTAL SCIENCE
SYLLABUS FOR B.E.II-SEMESTER

L : T : P (Hrs./week): 2 : 0 : 0	SEE Marks:60	Course Code: U21MC010CE
Credit: - - -	CIE Marks:40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
In this subject the students will	*Upon the completion of this course students will be able to*
1. Describe various types of natural resources available on the earth surface. 2. Explain the concepts of an ecosystem and the biotic and abiotic components of various aquatic ecosystems. 3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity. 4. Explain the causes, effects and control measures of various types of environmental pollutions. 5. Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain, ozone layer depletion, population explosion.	1. Describe the various types of natural resources. 2. Differentiate between various biotic and abiotic components of ecosystem. 3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India. 4. Illustrate causes, effects, control measures of various types of environmental pollutions. 5. Explain the methods of water conservation, causes, effects of climate change, global warming, acid rain and ozone layer depletion, population explosion.

UNIT-I: Environmental Studies: Definition, importance of environmental studies. Natural resources: Water resources; floods, drought, conflicts over water, dams-benefits and problems. Food resources; Effects of modern agriculture, fertilizer-pesticide problems, water logging salinity. Energy resources: Renewable and non-renewable energy resources. Land Resources, soil erosion and desertification.

UNIT-II: Ecosystems: Structure and function of an ecosystem, producers, consumers and decomposers, food chains, food webs, ecological pyramids, aquatic ecosystems (ponds, oceans, estuaries).

UNIT-III: Biodiversity: Genetic, species and ecosystem diversity. Values of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV: Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid waste & e-waste management.

UNIT-V: Social Aspects and the Environment: Water conservation, Climate change, global warming, acid rain, ozone layer depletion. Environmental Impact Assesment, population explosion.

Learning Resources:
1. Deswal S. and Deswal A., A Basic Course on Environmental studies, DhanpatRai& Co Pvt. Ltd. 2016
2. Benny Joseph, Environmental Studies, Tata McGraw-Hill, 2017
3. Suresh K. Dhameja, Environmental Studies, S.K. Kataria& Sons, 2010.
4. De A.K., Environmental Chemistry, New Age International, 2003.
5. Odum E.P., Fundamentals of Ecology, W.B. Sunders Co., USA, 2004.
6. Rajagopalan R., Environmental Studies, Second Edition, Oxford University Press, 2015

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	2	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	2	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB
SYLLABUS FOR B.E.II-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: **U21HS111EH**
Credits :01	CIE Marks:30	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	**On completion of the course, students will be able to:**
1. Learn the speech sounds, parts of speech and distinguish between vowel and consonant sounds in the English language to reduce mother tongue influence when speaking English.	1. Speak well using 'generally acceptable English' in terms of pronunciation and use of diction.
2. Understand and follow the rules in debates, group discussions, interviews.	2. Participate effectively in group discussions, public speaking, debates (formal and informal).
3. Develop reading skills and analyse various text types.	3. Analyse, evaluate and infer meaning from different types of texts.

1.0 PHONETICS LAB- TOPICS
1.1 **Introduction to English Phonetics:**
Introductory to auditory, acoustic and articulatory phonetics. Organs of
speech: the respiratory, articulatory and phonatory systems.
1.2 **Aspects of language learning and ear training activities-**
Homophones, homonyms. Words often confused. Parts of speech-
Identification and pronunciation of nouns, adjectives, verbs andadverbs.
Longman Dictionary of Contemporary English- 6th Edition, 2020.

2.0 INTERACTIVE COMMUNICATION SKILLS LAB-TOPICS
2.1 **Group discussion:**
Objectives of GD, Types of GDs; Initiating, Continuing, and concluding a
GD.
2.2 **Debate:**
Understanding the difference between a debate and a group discussion,
essentials of debates.

2.3 **Public speaking:**
Dos and don'ts of public speaking. Listening and analysing speeches of greatpersonalities in history, TED talks, Documentaries and Movies.

2.4 **Interview Skills - Basic HR questions.**
Viva questions will be asked in internal and external exams.

3.0 READING SKILLS LAB - TOPICS

3.1Teaching different types of texts for comprehension
3.2 **Poster Reading-** Analysing data, specific vocabulary items &pictorial forms and convert the sameto a reading text and vice versa.
Viva questions will be asked in internal and external exams.
Longman Dictionary of Contemporary English - 6th Edition, 2020.

Prescribed textbook for laboratory:
Speak Well:JayshreeMohanraj, KandulaNirupa Rani and Indira Babbellapati - Orient Black Swan

Longman Dictionary of Contemporary English - 6th Edition, 2020.(The students will be given the PDF format)
Learning Resources:
1. Balasubramanian: A textbook of English phonetics for Indian students, Macmillan, 2008.
2. PriyadarshiniPatnaik : Group discussion and interviews, Cambridge University Press India private limited 2011.
3. Daniel Jones: Cambridge English Pronouncing Dictionary - A Definitive guide to contemporary English Pronunciation.
4. Reading Cards (Eng400): Orient Black Swan. Reading Squabble - Hadfield.
5. Rudolph F. Verderber, Kathleen S. Verderber, Deanna D. Sellnow: *The Challenge of Effective Speaking*2012

The break-up of marks for CIE:
Internal Tests (1);   Quiz Tests (1)   +
Assignments(1)
No. of Internal Tests: 1   Max. Marks for Internal
Test: 30
Duration of Internal Test: 120 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Physics
APPLIED PHYSICS LAB
SYLLABUS FOR B.E.II-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: **U21BS011PH**
Credits :01	CIE Marks:30	Duration of SEE:03Hours

Course Outcomes	BTL
The students acquire the ability to	
1. Conduct experiment dependently and record the measurements.	2
2. Outline the precautions required to be taken for each experiments	1
3. Compare the experimental results with standard values and estimate errors.	2
4. Draw graphs and interpret the results with respect to graphical and theoretical values	2
5. Write the summary of the experiment and draw appropriate conclusions	1

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	2	-	-	2	2	-	-	-	2	-	-	2	1
CO2	3	-	-	-	-	-	-	-	-	-	-	1	1
CO3	2	2	-	2	2	-	-	1	-	-	-	1	1
CO4	3	-	-	-	2	-	-	-	-	-	-	1	1
CO5	2	-	-	-	-	-	-	1	-	2	-	2	1

1. Determination of moment of inertia of a Fly Wheel
2. Estimation of errors in the time period and determination of 'g' using Simple pendulum
3. Torsional Pendulum to calculate rigidity modulus of material of a wire.
4. Determination of frequency of electrically maintained Tuning fork-Melde's experiment
5. Determination of radius of gyration and acceleration due to gravity using Compound Pendulum.
6. Determination of wavelength of Semiconductor lasers.
7. Determination of radius of curvature of a Plano-convex lens by forming Newton's Rings.
8. Determination of wavelength under normal incidence method using diffraction grating

9. Determination of specific rotation of an optically active solution by polarimeter
10. Calculation of numerical aperture, acceptance angle and power loss due to bending of an optical fibre.
11. Study of I-V characteristics of P-N Junction diode
12. Estimation of Thermistor constants
13. Study of I-V characteristics of solar cell and to calculate fill factor and efficiency
14. Gyroscope- study of gyroscopic effects.
15. Determination of wavelength of a light source by Michelson interferometer

Each student should perform at least 12 (Twelve) experiments.

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Department of Mechanical Engineering
ENGINEERING WORKSHOP-II
SYLLABUS FOR B.E.II-SEMESTER
(Common to Mechanical, Civil & EEE Branches)

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: **U21ES211ME**
Credits :01	CIE Marks:30	Duration of SEE:03Hours

COURSE OBJECTIVES *The course will enable the students to*		COURSE OUTCOMES *On completion of the course, students will be able to*	
1	know basic workshop processes, adopt safety practices while working with various tools	1	create models in Smithy, Welding, fitting and Machining trades by using the relevant tools.
2	identify, select and use various marking, measuring, holding, striking and cutting tools &equipments.	2	measure and inspect the finished components using suitable measuring instruments.

List of the Experiments:
BLACK SMITHY
1. Flattening (round to square cross section)
2. Bending operation (U-shape)
3. S-shape hook

WELDING
1. Bead formation using arc welding
2. Butt joint & T joint using arc welding
3. Lap joint using gas welding`

FITTING
1. Template fitting (square fit)
2. V-groove fit
3. Drilling and Tapping

MACHINING
1. Plain turning and step turning
2. Taper turning
3. Thread cutting

ADDITIONAL EXPERIMENTS
1. Black Smithy: Fullering operation (demo)
2. Welding: Spot welding (demo)
3. Fitting: Assembly of pulley on a shaft with key (demo)
4. Machining: Additive manufacturing (demo)

Learning Resources:

1. Hajra Choudhury S.K., Hajra Choudhury A.K., Nirjar Roy S.K. "Elements of Workshop Technology" Vol-I 2008 & Vol-II 2010 Media Promoters & Publishers Pvt. Limited, Mumbai.
2. Kalpakjian S. and Steven R. Schmid, "Manufacturing Engineering and Technology" 4th Edition, Pearson Education India, 2002.
3. Gowri P., Hariharan and Suresh Babu A., "Manufacturing Technology-I", Pearson Education 2008.
4. P. Kannaiah& K. L. Narayana "Workshop manual" 2nd Ed., Scitech publications (I) Pvt. Ltd., Hyderabad.
5. B.L. Juneja, "Workshop Practice", Cengage Learning India Pvt. Limited, 2014.
6. www.technologystudent.com
7. www.mewelding.com

The break-up of CIE:

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: **2 Hours**			