BIKANER TECHNICAL UNIVERSITY, BIKANER
बीकानेर तकनीकी विश्वविद्यालय, बीकानेर
OFFICE OF THE DEAN ACADEMICS

150 YEARS OF CELEBRATING THE MAHATMA

SCHEME & SYLLABUS OF
B. Tech. First Year

(1st and 2nd Semesters)

(Common to all branches of UG Engineering & Technology)

Bikaner Technical University
बीकानेर तकनीकी विश्वविद्यालय
ESTD.
2017
ज्ञान संस्कार उद्यम

Effective for the students admitted in year 2021-22 and onwards

Approved by 7th academic council meeting held on 01/11/2021

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Bikaner Technical University
Bikaner

Teaching & Examination Scheme B.Tech. 1st Year-1st Semester

Effective from Session 2021-22
(Common to all branches of UG Engineering & Technology)

S.No.	Category	Course Code	Course Title	Hours			Marks			Credit
				L	T	P	IA	ETE	Total	
1	UCB	1FY1-01	Engineering Mathematics-1	3	1	-	30	70	100	**4**
2	UCB	1FY1-02 / 1FY1-03	Engineering Physics / Engineering Chemistry	3	-	-	30	70	100	**3**
3	UCH	1FY3-04 / 1FY3-05	Communication Skills / Managerial Economics and Financial Accounting	2	-	-	30	70	100	**2**
4	UCE	1FY2-06 / 1FY2-07	Introduction to Built Environment /Basic Electrical Engineering	3	-	-	30	70	100	**3**
5	UCE	1FY2-08 / 1FY2-09	Computer Fundamentals & Programming / Elements of Mechanical Engineering	3	-	-	30	70	100	**3**
6	UCB	1FY1-20 / 1FY1-21	Engineering Physics Lab / Engineering Chemistry Lab	-	-	2	60	40	100	**1**
7	UCH	1FY3-22 / 1FY3-23	Communication Skills Lab / Technical Communication Lab	-	-	2	60	40	100	**1**
8	UCE	1FY2-24 / 1FY2-25	Computer Programming Lab / Mechanical Workshop Practice	-	-	3	60	40	100	**1.5**
9	UCE	1FY2-26 / 1FY2-27	Built Environment Practices / Basic Electrical Engineering Lab	-	-	2	60	40	100	**1**
10	UCE	1FY2-28	Engineering Visualization	-	-	3	60	40	100	**1.5**
Total									**1000**	**21**

L = Lecture, **T** = Tutorial, **P** = Practical, **IA** = Internal Assessment, **ETE** = End Term Exam, **Cr** = Credits

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Teaching & Examination Scheme B.Tech. 1st Year – 2nd Semester

Effective from Session 2021-22
(Common to all branches of UG Engineering & Technology)

S.No.	Category	Course Code	Course Title	Hours			Marks			Credit
				L	T	P	IA	ETE	Total	
1	UCB	2FY1-01	Engineering Mathematics-2	3	1	-	30	70	100	**4**
2	UCB	2FY1-03 / 2FY1-02	Engineering Chemistry / Engineering Physics	3	-	-	30	70	100	**3**
3	UCH	2FY3-05 / 2FY3-04	Managerial Economics and Financial Accounting / Communication Skills	2	-	-	30	70	100	**2**
4	UCE	2FY2-07 / 2FY2-06	Basic Electrical Engineering / Introduction to Built Environment	3	-	-	30	70	100	**3**
5	UCE	2FY2-09 / 2FY2-08	Elements of Mechanical Engineering/Computer Fundamentals & Programming	3	-	-	30	70	100	**3**
6	UCB	2FY1-21 / 2FY1-20	Engineering Chemistry Lab / Engineering PhysicsLab	-	-	2	60	40	100	**1**
7	UCH	2FY3-23 / 2FY3-22	Technical Communication Lab/ Communication Skills Lab	-	-	2	60	40	100	**1**
8	UCE	2FY2-25 / 2FY2-24	Mechanical Workshop Practice/Computer Programming Lab	-	-	3	60	40	100	**1.5**
9	UCE	2FY2-27 / 2FY2-26	Basic Electrical Engineering Lab/ Built Environment Practices	-	-	2	60	40	100	**1**
10	UCE	2FY2-29	Computer Aided Machine Drawing	-	-	3	60	40	100	**1.5**
Total									**1000**	**21**

L = Lecture, **T** = Tutorial,   = Practical, **IA**=Internal Assessment, **ETE**=End Term Exam, **Cr**=Credits

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1st Semester

Common to all branches of UG Engineering & Technology

1FY1-01: ENGINEERING MATHEMATICS-1

Credit: 4 **Max. Marks: 100 (IA:30, ETE:70)**
3L+1T+ 0P **End Term Exams: 3 Hours**

Course Objectives:

- To provide essential knowledge of basic tools of differential calculus, ordinary differential equations and partial differential equation for degree students of engineering and technology.
- To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields

Course Outcomes:

Upon successful completion of the course the students will be able to

CO-1: Able to solve problems based on asymptotes, partial differentiation equations, curve tracing, maxima and minima, etc.

CO-2: Come to know about the ordinary differential equations and its applications also able to develop a mathematical model of linear differential equations.

CO-3: Able to solve basic engineering models through partial differential equations such as wave equation, heat conduction equation etc..

S. No.	Contents	Hours
1	**Differential Calculus-I**: Asymptotes (Cartesian Coordinates Only), Curvature(Cartesian Coordinates Only), Concavity, Convexity and Point of Inflexion (Cartesian Coordinates Only), Curve Tracing (Cartesian and Standard Polar Curves-Cardioids, Lemniscates of Bernoulli, Limacon, Equiangular Spiral).	8
2	**Differential Calculus-II**: Partial Differentiation, Euler's Theorem on Homogeneous Functions, Maxima & Minima of Two and More Independent Variables, Lagrange's Method of Multipliers.	6
3	**Differential Equations-I**: Differential Equations of First Order and First Degree - Linear Form, Reducible to Linear form, Exact Form, Reducible to Exact Form, Linear Differential Equations of Higher Order with Constant Coefficients Only.	10
4	**Differential Equations-II**: Second Order Ordinary Differential Equations with Variables Coefficients, Homogeneous and Exact Forms, Change of Dependent Variable, Change of Independent Variable, Method of Variation of Parameters.	10
5	**Partial Differential Equations**: Partial Differential Equations of First Order: Lagrange's Form, Standard Forms, Charpit's Method.	6
	Total	**40**

Suggested Books:

1. Peter V O' Neil, Advanced Engineering Mathematics, Cengage Learning Publication, 7th Edition.
2. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones & Bartlett, 4th Edition.
3. George B. Thomas, Joel Hass and Christopher Heil, Thomas' Calculus, Pearson, 14th Edition.
4. R. K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition.
5. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education.
6. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley, 10th Edition.

1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY1-02 / 2FY1-02: ENGINEERING PHYSICS

Credit: 3 **Max. Marks: 100 (IA: 30, ETE: 70)**

3L+0T+ 0P **End Term Exams: 3 Hours**

Course Objectives:

- Analyze the intensity variation of light due to interference and diffraction
- Explain working principle of lasers
- Explain fundamentals of quantum mechanics and apply to one dimensional motion of particles
- Understand the basic properties of advance materials and nanomaterials
- To formulate and solve the engineering problems on Electromagnetism

Course Outcomes:

Upon successful completion of the course the students will be able to

CO-1: Be able to understand the phenomenon of interference in thin films and diffraction by slits

CO-2: Be able to understand the principle behind the working of LASERS and Optical Fibers

CO-3: Be able to understand concept of quantum mechanics and one dimensional motion of particle

CO-4: Be able to understand various properties of semiconductor, superconductor and nanomaterial

CO-5: Be able to understand electric and magnetic field behavior and drive Maxwell equations

S. No.	Contents	Hours
1	**Wave Optics**: Concept of interference, Interference in thin films (reflected light)-Newton's Rings and Michelson's Interferometer, Application as wavelength measurement. Concept of Diffraction, Single slit Fraunhofer Diffraction, Diffraction Grating and Spectrum, Determination of Wavelength, Application of Grating as wavelength splitter.	8
2	**Lasers & Optical Fibers**: Laser: Einstein's Theory of laser action; Einstein's coefficients; population inversion and lasing action, Properties of Laser beam, Construction and working of He-Ne and semiconductor lasers, Applications of Lasers in Science and engineering. Optical Fiber: Structure, Types, Features, Light guiding mechanism, Acceptance angle and Numerical Aperture.	8
3	**Quantum Mechanics**: Concepts and Experiments that led to the discovery of Quantum Nature. Heisenberg uncertainty principle; Wave function and basic postulate of wave mechanics, Schrodinger time independent and time dependent wave equations, Physical interpretation of wave function and properties. The free particle problem - Particle in 1-dimensional and 3-dimensional boxes, Concept of Quantum mechanical tunneling	9
4	**Physics of Advanced Materials:** Types of semiconductors, Conductivity in semiconductors, Energy Band Gap, Hall Effect: Theory and applications, Superconductors: Properties, Meissner effect, Type I & II superconductors, Applications of superconductors, Nano-materials: Significance of nanoscale, Properties of nanomaterials, Basics of Synthesis of nanomaterials: top-down and bottom-up approach, Applications of nanomaterials, X-ray Diffraction.	8
5	**Introduction to Electromagnetism:** Gradient, divergence and curl and their physical	7

	significance, Divergence and Curl of electrostatic and static Magnetic Fields, Faraday's law, equation of continuity, Displacement current, Maxwell's equations, Electromagnetic wave propagation in free space Flow of energy and Poynting vector.	
	Total	**40**

Suggested Books:

1. Halliday, Resnic and Walker, "Fundamentals of Physics", Publisher: John Wiley, Ninth Edition.
2 Beiser A, "Concepts of Modern Physics", Publisher: McGraw Hill International, Fifth Edition.
3 Ajoy Ghatak, "Optics", Publisher: Tata McGraw Hill, Fifth Edition.
4 S. O. Pillai, "Solid State Physics", Publisher: New Age Publishers.
5 A. Ghatak, K. Thyagarajan, "Introduction To Fiber Optics", Publisher: Cambridge University Press.
6 W.T Silfvast, "Laser Fundamentals", Publisher: Cambridge University Press.
7 R. Shankar, "Fundamentals of Physics", Publisher: Yale University Press, New Haven and London.
8 R. Shankar, "Fundamentals of Physics II", Publisher: Yale University Press, New Haven and London.
9 David J. Griffiths, "Introduction to Electrodynamics", Publisher: Cambridge University Press.
10 K. K. Chattopadhyay and A. N. Banerjee, "Introduction to Nanoscience and Nanotechnology", Publisher: PHI Learning Pvt. Limited.
11 T. Pradeep, "NANO: The Essentials, understanding Nano science and Nanotechnology", Publisher: Tata McGraw-Hill Publishing Company Limited.

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1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY1-03 / 2FY1-03: ENGINEERING CHEMISTRY

Credit: 3 **Max. Marks: 100 (IA: 30, ETE: 70)**

3L+0T+ 0P **End Term Exams: 3 Hours**

Course Objectives:

- To acquire knowledge of new treatment technology of municipal water and provide an insight into latest (R&D oriented) topics.
- To understand the various eco-friendly and economic processing and manufacturing techniques various types of fuels.
- To understand mechanism of corrosion and preventive methods.
- To lay foundation for the application of new engineering materials such as cement, glass and lubricants in engineering and technology.
- To impart knowledge of green chemistry and its applications.

Course Outcomes:

Upon successful completion of the course the students will be able to

CO-1: Students will be able to understand the new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.

CO-2: Students will be able to solve the problems related to use of water as an engineering materials in industry and elsewhere.

CO-3: Students will be able to understand and apply the various eco-friendly processing and manufacturing techniques of fuels.

CO-4: Students will be able to understand the cause and hence the remedies of Corrosion, this stepping ahead in direction of sustainable infrastructure developments.

CO-5: Students will be able to predict the potential applications of new engineering materials and green chemistry.

S. No	Contents	Hours
1	**Water:** Common impurities, hardness, determination of hardness by complex metric (EDTA method), degree of hardness, units of hardness, municipal water supply: requisite of drinking water, purification of water; sedimentation, filtration, disinfection, breakpoint chlorination, boiler troubles: scale and sludge formation, internal treatment methods, water softening; Lime-Soda process, demineralization process, reverse osmosis. numerical problems based on hardness, EDTA and Lime-Soda process.	10
2	**Organic Fuels:** Solid fuels: Coal, classification of coal, proximate and ultimate analyses of coal and its significance, gross and net Calorific value, determination of calorific value of coal by Bomb Calorimeter, metallurgical coke, carbonization processes; Otto-Hoffmann by-product oven method. Liquid fuels: Advantages of liquid fuels, refining and composition of petroleum, synthetic petrol, cracking, reforming, knocking, octane number, anti-knocking agents. Gaseous fuels: Advantages, manufacturing, composition and calorific value of coal gas and oil gas, determination of calorific value of gaseous fuels by Junker's Calorimeter	10

	Numerical problems based on determination of calorific value (Bomb Calorimeter/Junkers Calorimeter and Dulong's formula and combustion of Fuel.	
3	**Corrosion:** Definition and significance of corrosion, mechanism of chemical (dry) and electrochemical (wet) corrosion, galvanic corrosion, concentration corrosion and pitting corrosion. Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode modifications in design.	05
4	**Engineering Materials:** **Portland Cement:** Definition, manufacturing by Rotary Kiln, role of gypsum, chemistry of setting and hardening of cement. **Glass:** Definition, manufacturing by tank furnace, significance of annealing, types and properties of soft glass, hard glass, borosilicate glass. **Lubricants:** Classification, mechanism, properties; viscosity and viscosity index, flash and fire point, cloud and pour point.	10
5	**Green Chemistry:** Definition and Concepts of green chemistry, principles of green chemistry, waste or pollution prevention hierarchy, green chemistry and sustainability development, use of alternative feedstock (Bio fuel), green solvents, alternative sources of energy: use of microwaves and ultrasonic energy.	05
	Total	**40**

Suggested Books:

1. E. R. Nagrajan, Engineering Chemistry, Wiley India,
2. S. D. Faust Samuel and O. M. Aly, Chemistry of Water Treatment, CRC Press.
3. O.G. Palanna, Engineering Chemistry, McGraw Hill Education, India.
4. P. R. Roberge, Handbook of Corrosion Engineering, McGraw-Hill Education.
5. P. A. Schweitzer, Corrosion Engineering Handbook, CRC Press.
6. A. Matlack, Introduction to Green Chemistry, CRC Press.
7. M. Lancaster, Green Chemistry: An Introductory Text, RSC Publishing.
8. V.K. Ahluwalia, Green Chemistry: A Text Book, Narosa Publishing House.
9. S. Rattan, A text book of Engineering Chemistry, S. K. Kataria & Sons, New Delhi.
10. S.S. Dara, S.S. Umare, A text book of Engineering Chemistry, S. Chand & Company Ltd., New Delhi.

1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY3-04 / 2FY3-04: COMMUNICATION SKILLS

Credit: 2 **Max. Marks: 100 (IA: 30, ETE: 70)**

2L+0T+ 0P **End Term Exams: 3 Hours**

Course Objectives:

- The course is designed to facilitate our students to communicate effectively by emphasizing on practical communication through refurnishing their existing communication skills and also, to bring one and all to a common take off level.

Course Outcomes:

Upon successful completion of the course the students will be able to

CO-1: To develop a deep understanding of the basics of communication and to decipher the relevance of non-verbal communication.

CO-2: To make students aware of the importance of listening and reading skills for their personal and professional communication.

CO-3: To enable them to write paragraphs, letters precise coherently and cohesively.

CO-4: To help them learn correct usage of grammar.

CO-5: To inculcate creative and aesthetic sensibility in students.

S. No	Contents	Hours
1	**Communication Skills: I (Speaking)** • Importance of communication skills for career growth and personal development. • Process and 7'Cs of communication. • Barriers of effective communication and measures to overcome them. • Articulation of thoughts and improving fluency in speaking. • Developing assertiveness in speaking. • Interpersonal communication and the art of persuasion. • Non - verbal communication	5
2	**Communication skills: II (Listening and Reading)** • Effective listening and its importance. • Blocks in effective listening. • Guidelines for effective listening. • The art of reading skills (intensive, extensive, skimming, scanning) • Overcoming common obstacles of reading.	5
3	**Communication skills: III (Writing)** • Benefits of effective writing skills for engineering students. • Ways to improve writing skills. • Art of condensation: Paragraph writing (progression of thoughts / ideas in paragraph writing)	5

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	• Formal and informal letters (meaning and basic difference in language and format.)	
4	**Essentials of grammar:** Tenses, Active and Passive Voice, Modals, Conditionals	5
5	**Communication through poems and short stories** **Poems:** 'All the world's a stage' by William Shakespeare, 'A psalm of life' by Henry Wadsworth Longfellow **Short Stories**: 'Three Questions' by Leo Tolstoy, 'The Necklace' by Guy de Maupassant	5
	Total	**25**

Suggested Books:

1. Mohan Krishna And Meera Banerji, Developing Communication Skills, Macmillan Press.
2. Raymond Murphy, Intermediate English Grammar, Cambridge University.
3. F.Grellet, Developing Reading Skills, Cambridge University Press.
4. Michal Sawan, Practical English Usage, Cambridge University Press.
5. Coe, Ryeroft, Ernest, Writing Skills, Cambridge University Press.
6. Jermy Comfort, Speaking Effectively, Cambridge University Press.
7. N. Krishnawany, reative English for Communication, Macmillan.
8. Madhulika Jha, Echoes, Orient Long Man.

1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY3-05 / 2FY3-05: MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING

Credit: 2 **Max. Marks: 100 (IA: 30, ETE: 70)**

2L+0T+ 0P **End Term Exams:3 Hours**

Course Objectives:

- To understand the concepts of managerial economics and financial analysis this helps in optimal decision making in business environment.
- To be familiar with demand concepts, types of methods or techniques of demand those are used by the entrepreneur or producer.
- To have a thorough knowledge on the production theories and cost while dealing with the production and factors of production.
- To introduce the concepts of cost and significance, limitation of Break-even analysis.
- To provide the optimal decisions acquiring the knowledge on financial accounting and its analysis.

Course Outcomes: Students will be able to

CO-1: Analyze various aspects of managerial economics, production & cost analysis, markets & pricing strategies.

CO-2: Develop an ability to identify, formulate, and solve engineering problems by applying the subject knowledge of Managerial economics.

CO-3: Apply capital budgeting, financial analysis techniques in evaluating various investment opportunities

CO-4: Enhance their capabilities in the interpretation of balance sheets are followed in industries, organizations & institutes.

S. No.	Contents	Hours
1	**Introduction:** Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects. Economic problems: scarcity and choice. Concept of Inflation.	02
2	**Demand and Supply Analysis:** Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.	04
3	**Production and Cost Analyses:** Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale. **Different cost concepts:** opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs – **Cost –Volume-Profit analysis**-Determination of Breakeven point (simple problems) - Managerial significance and limitations of Breakeven point.	05
4	**Market structure and pricing theory:** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	05
5	**Types of Business Organization and Business Cycles:** Features and Evaluation of Sole	

	Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of a Business Cycle.	04
	Financial statement analysis: Introduction to Accounting & Financing Analysis: Introduction to Double Entry Systems – Preparation of Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet) **Ratio Analysis –** Liquidity Ratio (Current Ratio, Quick Ratio), Working Capital Ratio, Earning Per Share, Debtors and Creditors turnover ratio, Net profit and Gross profit ratio.	08
	Total	**28**

Suggested Books:

1. M. Kasi Reddy and S. Saraswati, Managerial Economics and Financial Accounting, Prentice Hall India Learning Private Limited.
2. P. Vijaya Kumar and N. Appa Rao, Managerial Economics & Financial Analysis, Cengage, 1st edition.
3. S.A. Siddiqui and AS Siddiqui, Managerial Economics and Financial Analysis, New Age International (P) Ltd Publishers, 2nd Edition.
4. A.R. Aryasri, Managerial Economics and Financial Analysis, The McGraw-Hill Publishing Company Limited, Delhi, 3rd Edition.
5. M.S. Bhat and A.V. Rau, Managerial Economics and Financial Analysis, BS Publications.
6. N. Appa Rao, P. Vijay Kumar, Managerial Economics and Financial Analysis, Cengage Publications.
7. A. R. Aryasri, Managerial Economics and Financial Analysis, TMH.
8. J.V.Prabhakararao, P. Venkatarao Managerial Economics and Financial Analysis, Ravindra Publication.

1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY2-06 / 2FY2-06: INTRODUCTION TO BUILT ENVIRONMENT

Credit:3 **Max. Marks: 100 (IA: 30, ETE: 70)**
3L+0T+ 0P **End Term Exams: 3 Hours**

Course Objectives:

- To provide relevant knowledge of elements of built environment
- To introduce the modern concepts of smart and green
- To understand and appreciate the role of Civil Engineering
- To provide a fundamental understanding of the ergonomics related to buildings

Course Outcomes: At the end of the course, the students will be able to learn and identify

CO-1: At the end of the course, the students will be able to learn and identify

CO-2: The role of engineering in general in making the built environment

CO-3: The practices and issues that need to be addressed to offer the occupants a physical, functional environment with psychological well-being.

S. No	Contents	Hours
1	**Built Environment**: Definition, need and purpose **Elements of Built Environment**: • Homes, Offices and Commercial Buildings, Parks and Recreation Centers (Civil Engineering is the basis for developing the built-environment) • Transportation systems consisting of roads, railway tracks, culverts, and Airport runways • Water resources and water systems • Infrastructure mainly consisting of buildings, bridges, Tunnels, dams, canals, sewer systems • Ground support system	6
2	**Modern world approach towards Built Environment:** (Internet of Things and the 'Smart' concept) • Domestic and home automation- Energy and water use, remote control appliances, intrusion detection systems • Smart cities- Smart parking, structural health, noise urban maps, electromagnetic field levels, smart lighting, smart roads • Smart environment- Forest fire detection, air pollution control, snow level monitoring, landslide and avalanche prevention, earthquake early detection • Smart water- Potable water monitoring, chemical leakage detection in rivers, swimming pool remote measurement, water leakages, river floods • Smart metering- Smart grid, monitoring of tank level, water flow • Security and emergencies- Perimeter access control, liquid presence, radiation levels, explosive and hazardous gases • Smart Retail- Supply-chain control, NFC payment, smart product management	6

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3	**Engineering divisions and roles in built environment:** • Structural Engineering- Takes care of analysis and design of various structural systems (such as Buildings, Bridges, and other infrastructure), Stability and strength aspects, Earthquake resistant design aspect • Geotechnical Engineering- Takes care of soils types and their responses under loads, effects of varying moisture conditions, Foundation types and support behaviours • Transportation Engineering- Takes care of various types of transportation systems, Role of transportation with respect to socio-economic conditions, Various road traffic signs, Accidents prevention and Road Safety measures, traffic calming • Hydraulic and Water Resource Engineering- Takes care of groundwater occurrences, Groundwater management, Water Resources Planning (elaborate purposes and objectives), Field-water storage structures, Rain-water harvesting, Water Pollution: Water quality standards, Introduction to treatment and discharge of waste water. Reuse and saving of water • Environmental and Energy Engineering- Deals with Environmental Pollution, Environmental Acts and Regulations, Functional concepts of Ecology, Hydrological Cycle; Chemical Cycles: Energy Flow in Eco-systems.	10
4	**Historical architecture and modern structural design:** Building Planning: Proportion, orientation, site plan, working drawing Building layout, Architectural and structural working drawings, Standard codes as measure of controlling safety and serviceability, Building bye-laws and their role in controlled development of built-environment, Concept of Green Buildings **Constructions** Conventional constructions: Masonry, Timber, Steel and concrete constructions Introduction to Additive Construction methods using concrete (3D Printed Building)	10
5	**Building Physics/Ergonomics/Comfort:** • **Thermal aspects of a building-** Outside environment and human needs, Heat flow, Air flow, Humid air, Thermal comfort and insulation, Condensation and moisture, Climate-responsive design, Passive controls, thermal balance, Forms of energy and active heating/cooling • **Lighting aspects of a building-** Physics of light, photometry, concept of sun light and ventilation, Vision and colours, visual comfort, Electric lighting, • **Acoustic aspects of a building-** Noise insulation, Room acoustics, Construction principles, foundations, Sound, and hearing	10
	Total	**42**

Suggested Books:

1. Szokolay, Steven. Introduction to Architectural Science: The Basis of Sustainable Design. Burlington, MA: Architectural Press, Routledge.
2. Anderson, Larz T. Planning the Built Environment. Routledge.
3. Santamouris, Matheos. Energy and Climate in the Urban Built Environment. Routledge.
4. Lopez, Russell P. The built environment and public health. John Wiley & Sons.
5. Gopi, Satheesh. Basic Civil Engineering, Pearson.
6. M.S. Palanichamy, Basic Civil Engineering, 4th Edition, Tata McGraw -Hill.

7. J.M. Illston; E & FN Spon, Construction Materials: Their Nature & Behaviour, Spon Press.
8. Michale S. Mamlouk and Jhon P. Zaniewski, Materials for Civil and Construction Engineers, Pearson Noida.
9. C.S. Papacostas and P.V. Perverdourous, Transportation Engineering and Planning, Prentice Hall.

1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY2-07 / 2FY2-07: BASIC ELECTRICAL ENGINEERING

Credit: 3 **Max. Marks: 100 (IA: 30, ETE: 70)**

3L+0T+ 0P **End Term Exams: 3 Hours**

Course Objectives:

- To expose the students to the basic principles in Electrical Engineering and their relevance by covering all the fundamental concepts.
- To teach the basic concepts of DC and DC systems, transformer and electrical machines. Thermodynamics and various power and refrigeration cycles.
- To teach the primary electronic devices including SCR, TRIAC and UJT.

Course Outcomes:

CO-1: Acquire the knowledge regarding the various laws and principles associated with electrical systems considering DC and AC supply.

CO-1: Analysis of Single Phase & Three phase AC Circuits, the representation of alternating quantities and determining the power in these circuits.

CO-2: Acquire the knowledge regarding basic principles of electrical machines, transformer and apply them for practical problems.

CO-3: Acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor, SCR, TRAIC and UJT.

CO-4: Acquire the basic knowledge about the modulation, demodulation, radio receiver, television and various communication.

S. No	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**DC Circuits**: Electric Current, Electric Power, Ohm's Law, Classification of Network Elements, Source Conversion. Kirchoff's Laws, Node Voltage and Mesh Analysis; Star-Delta and Delta-Star Transformation, Superposition Theorem, Thevenin's Theorem.	9
3	**AC Circuits**: Generation of AC Voltage, EMF Equation, Average, RMS and Effective Values AC quantities, RLC Series, Parallel and Series-Parallel Circuits, Complex and Phasor Representation of AC quantities, Power and Power Factor. Three Phase A.C. Circuits: Delta and Star-Connection, Line & Phase Quantities, Phasor Diagram, Measurement of Power in Three Phase Balanced Circuits.	9
4	**Transformer and Electrical Machines**: Faraday's Law of Electromagnetic Induction, Construction and Operation of Single-Phase Transformer, EMF Equation, Voltage and Current Relationships, Phasor Diagram of Ideal Transformer at no-load and on-load, **DC Machines**: Principle of DC Machines, Types, Construction and operation of DC Machines.	8
5	**Basic Electronic Devices**: PN Junction Diode, Rectifiers, Bipolar Junction Transistor, Transistor Current Components, Characteristics of CE, CB and CC, Application of Transistor	8

	as Amplifier. **Thyristors**: Silicon Controlled Rectifier (SCR), Bi-directional thyristors (TRIAC), the uni-junction transistor (UJT).	
6	**Communication System**: Introduction to modulation (AM, FM and PM), Demodulation, Multiplexing, Superheterodyne radio receiver, television, Elementary concepts of optical, satellite and mobile communication.	7
	Total	**42**

Suggested Books:

1. B.L. Theraja and A.K. Theraja, Text Book of Electrical Technology, S. Chand Publications
2. C. L. Wadhwa, Basic Electrical Engineering, New Age International Publishers
3. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill
4. Ashfaq Husain and Harroon Ashfaq, Fundamentals of Electrical Engineering, Dhanpat Rai and Co.
5. P.S. Bimbhra, Electrical Machinery, Khanna Publishing
6. A. Chakrabarti, Circuit Theory (Analysis and Synthesis), Dhanpat Rai and Co.

1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY2-08 / 2FY2-08: COMPUTER FUNDAMENTALS AND PROGRAMMING

Credit: 3 **Max. Marks: 100 (IA: 30, ETE: 70)**

3L+0T+ 0P **End Term Exams: 3 Hours**

Course Objectives:

- To introduce the concept of Computer Fundamentals and Computer Programming.
- To enable the student to design algorithms and flowcharts.
- To enable the students to understand programming using the "C" language.
- To enable students to apply C language in problem-solving.

Course Outcomes: Upon successful completion of the course, the students will be able to

CO-1: Know the Essential components of the computer and working hardware device.

CO-2: Design the algorithms and flowcharts for the problems.

CO-3: Understand the fundamentals of C programming.

CO-4: Use suitable data structure and logic for problem-solving.

S. No	Contents	Hours
1	**Fundamentals of Computer:** Stored program architecture of computers, Storage device-Primary memory, and Secondary storage, Random, Direct, Sequential access methods, Concepts of High-level, Assembly and Low-level languages, hardware, software, firmware, source file, object file, translators, assembler, compiler, interpreter. Representing algorithms through flowchart and pseudocode. **Number system:** Data representations, Concepts of radix and representation of numbers in radix r with special cases of r=2, 8, 10 and 16 with conversion from radix r1 to r2, r's and (r-1)'s complement, Binary addition, Binary subtraction, Representation of alphabets.	8
2	**C Language:** 'C' character set, literals, keywords, identifiers, Data types in C, ASCII Code, variable declaration, expression, labels, statements, formatted input-output statements, types of operators, Operators Expressions Associativity, Precedence of Operators, Expression Evaluation, Data Type conversion, mixed-mode arithmetic's.	6
3	**Control Statement and Loop in C: Control Statement:** If statement, Nested if, if-else statement, Else if ladder, Switch Statement, Conditional Operator (?:) Statement, Go To Statement **Looping and Iteration**- Basic Iteration (Initialization, steps, termination), while statement, do while statement, For statement, Break statement, Continue statement,	6
4	**Arrays, Pointers & Structure in C:** Arrays– Basic concepts, one-dimensional arrays, two-dimensional arrays, multidimensional arrays, C programming examples related to Arrays. **Pointers:** Pointer Arithmetic, Programming using Arrays and Pointers, Size of Operator, Memory allocation functions, an array of pointers, pointers to void, command-line arguments, Structures and unions in C, Enumeration.	8

5	**Functions in C:** Functions- basics, user-defined functions, inter function communication (call by value, call by reference), Standard functions. Storage classes-auto, register, static, extern, scope rules, passing arrays to functions, Passing Structure to functions, Introduction to Recursion, Recursive functions. pointers to functions,	7
6	**Strings**: Concepts, C Strings, String Input / Output functions, string manipulation functions, string /data conversion. **Input and Output:** Concept of a file, streams, text files, and binary files, e, Opening and Closing files, file input/output functions (standard library input/output functions for files), file status & Positioning functions	7
	Total	**42**

Suggested Books:

1. H. M. Deitel and P. J. Deitel, C: How to program, 7th edition, Pearson Education.
2. Briain W. Kernighan and Dennis Ritchie, C Programming Language, Prentice Hall of India.
3. Byron Gottfried, Programming with C, Tata McGraw Hill.
4. Herbert Schildt, The Complete Reference C, Tata McGraw Hill.
5. Yashwant Kanetkar, Let us C, BPB Publication.
6. B.A. Forouzan and R.F. Gilberg, A Structured Programming Approach in C, Cengage Learning.

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1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY2-09 / 2FY2-09: ELEMENTS OF MECHANICAL ENGINEERING

Credit: 3 **Max Marks: 100 (IA : 20, ETE:80)**

2L+ 1T+ 0P **End Term Exams: 3hr**

Course Objectives:

- To expose the students to the thrust areas in Mechanical Engineering and their relevance by covering all the fundamental concepts.
- To teach the basic concepts of thermodynamics and various power and refrigeration cycles.
- To teach the primary mechanical processes and power transmission devices.

Course Outcomes:

CO-1: Students will be able to understand the basic concepts and laws of thermodynamics.

CO-2: Students will be able to understand the construction and working of power and refrigeration cycles

CO-3: Students will be able to understand the basics of various mechanical processes.

CO-4: Students will be able to understand the basics of various mechanical drives.

UNIT	Contents	Hours
1	**Thermodynamics**: Thermodynamic properties, closed and open systems, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of first law in heating and expansion of gases in non-flow processes only. **Second law of Thermodynamics:** Kelvin-Planck and Clausius statements. Reversible processes, Carnot cycle, Carnot theorem. Reversed Carnot cycle.	**8**
2	**Vapour Power Cycles:** Introduction to Carnot cycle, Rankine cycle (Elementary knowledge of working of Carnot/Rankine cycle, their component diagram, P-V and T-S diagram only) **Refrigeration and Air Conditioning**: Elementary concept of refrigeration and air conditioning; Vapour compression cycle; Working principles and schematic diagrams of refrigerators, air conditioners and ice plants.	**8**
3	**Gas Power Cycles:** Introduction. Air standard efficiency, other engine efficiencies and terms. Otto, diesel, dual and Brayton cycle. **Internal Combustion Engines:** Introduction, classification, terminology and description of I.C. Engines. Four stroke and two stroke petrol, gas and diesel engines. Comparison of petrol and diesel engines.	**8**
4	**Materials:** various materials and classification, properties, alloys and their application, smart materials, composite materials. **Manufacturing Processes**: Introduction to industrial revolution, concept of sustainable manufacturing. Metal forming processes: forging, rolling, extrusion, drawing, basics of gas welding and manual arc welding. brazing and soldering.	**8**
5	**Power Transmission:** Classification and applications of mechanical drives, like belts, ropes, chains and gear drives (excluding epicyclic trains) and their velocity ratios, ratio of tensions in belts.	**8**
	Total	**40**

Suggested Books

1. R. K. Rajput, Basic Mechanical Engineering, Laxmi Publications.
2. B. Agrawal, Mechanical Engineering, John Wiley & Sons.
3. P. Kumar, Basic Mechanical Engineering, Pearson Education India.
4. M. P. Poonia and S.C. Sharma, Basic Mechanical Engineering, Khanna Publishing House.
5. J. Benjamin, Basic Mechanical Engineering, Pentex Books.

1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY1-20 / 2FY1-20: ENGINEERING PHYSICS LAB

Credit: 1 **Max. Marks: 100 (IA: 60, ETE: 40)**

0L+0T+ 2P **End Term Exams: 3 Hours**

Course Objectives:

- To impart physical measurement skills.
- Develop the skills needed to set up the equipment required to test models or theory developed in the lecture course.
- Be able to interpret results and develop correct conclusions.
- Maintain a laboratory notebook and write formal reports of practical.

Course Outcomes:

Upon successful completion of the course the student will be able to

CO-1: Understand and Develop skills to impart practical knowledge in real time solutions.

CO-2: Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.

CO-3: Gain knowledge of new concept in the solution of practical oriented problems and to understand more deep knowledge about the solution to theoretical problems.

CO-4: Understand measurement technology, usage of new instruments and real time applications in engineering studies.

Contents

1. To study the formation of Newton's rings and determine the wavelength of light (Sodium lamp/LASER).
2. To determine the wavelength of light (Sodium lamp/LASER) with the help of Michelson interferometer.
3. To determine the wavelength of prominent lines of light (mercury) by using plane transmission diffraction grating.
4. To determine specific rotation of sugar using half shade/ biquartz polarimeter.
5. To determine the dispersive power of material of a prism with the help of spectrometer.
6. To determine the height of given object with the help of sextant.
7. To determination of band gap of semiconductor using a P-N junction diode.
8. To study the Hall Effect and determination of hall coefficient and charge carrier concentration.
9. To measure the numerical aperture of an optical fiber.
10. To determine the coherence length and coherence time of laser using He –Ne laser.
11. To study the charge and discharge of a condenser and hence determine the time constant.
12. To determination of resonating frequency and bandwidth by LCR circuit.
13. To study the B-H/I-H curve and hysteresis losses in a given magnetic material.

(Note: Perform any eight experiments as per institute)

Suggested Readings:

1. Physics Laboratory Manual.

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1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY1-21 / 2FY1-21: ENGINEERING CHEMISTRY LAB

Credit: 1	**Max. Marks: 100 (IA: 60, ETE: 40)**
0L+0T+ 2P	**End Term Exams: 3 Hours**

Course Objectives:

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To provide the students with a solid foundation in chemistry laboratory required to solve engineering problems.
- To provide students with the knowledge of practical implementation of fundamental concepts.

Course Outcomes:

Upon successful completion of the course students will be able to;

CO-1: Understand the quality parameter of water, lubricants and fuel.

CO-2: Carry out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

CO-3: Students will be able to understand the practical knowledge in the field of green chemistry.

	Contents
1.	Determination the hardness of water by EDTA method.
2.	Determination of residual chlorine in water.
3.	Determination of the strength of CuSO4 solution iodometrically by using hypo solution.
4.	Determination of pH of water samples by using pH meter.
5.	Determination of conductivity of water samples by using Conductometer.
6.	Proximate analysis of coal.
7.	Determination of the kinematic viscosity of lubricating oil by Redwood Viscometer No.-1 at different temperature.
8.	Determination of the flash & fire point of lubricant oil.
9.	Determination of cloud & pour point of lubricating oil.
10.	Preparation and characterization of biodiesel from vegetable oil/ waste cooking oil.
11.	Extraction of D-limonene from orange peel using liquid CO_2 prepared from dry ice.
(Note: Perform any eight experiments as per institute)	

Suggested Readings:

1. Chemistry Laboratory Manual.

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1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY3-22 / 2FY3-22: COMMUNICATION SKILLS LAB

Credit: 1 **Max. Marks: 100 (IA: 60, ETE: 40)**

0L+0T+ 2P **End Term Exams: 3 Hours**

Course Objectives:

- To identify speech sounds of English and know phonetic transcription and avoid common errors in pronunciation.
- To enable students to familiarize themselves with the use of tone and to enable them to speak with correct innotation.
- To develop confidence among students to speak in public and conquer stage fear.
- To make students start things on a pleasant note, to help them think differently and to help students get familiarize with better words.
- To expose them to a variety of learner- friendly mode of language learning.

Course Outcomes:

Upon successful completion of the course students will be able to:

CO-1: familiarize themselves with the use of tone and to enable them to speak with correct innotation

CO-2: Students will be able to develop confidence among students to speak in public and conquer stage fear.

Contents

1. Correct pronunciation of words in English. (Speech sounds and symbols BRP)
2. Articulation (diction) exercises
3. Role of intonation in speaking; effective uses of various tones
4. JAM (just a minute) sessions:
    - Describing objects / situations /people etc.
    - Expressing oneself appropriately.
    - Starters of good conversations (making requests, seeking permission, introducing oneself etc.)

Vocabulary building.

5. Role play

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1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY3-22 / 2FY3-22: TECHNICAL COMMUNICATION LAB

Credit: 1	**Max. Marks: 100 (IA: 60, ETE: 40)**
0L+0T+ 2P	**End Term Exams: 3 Hours**

Course Objectives:

- To help engineering students be effective technical communicators in academic and professional environment.

Course Outcomes:

Upon successful completion of the course

CO-1: To identify speech sounds of English and know phonetic transcription and avoid common errors in pronunciation.

CO-2: To enable students to familiarize themselves with the use of tone and to enable them to speak with correct innotation.

CO-3: To develop confidence among students to speak in public and conquer stage fear.

CO-4: To make students start things on a pleasant note, to help them think differently and to help students get familiarize with better words.

CO-5: To expose them to a variety of learner- friendly mode of language learning.

Contents

1. Conversation skills for interviews through correct display of the English language.
    - Answering strategies
    - Handling questions
    - Telephonic interviews (telephone/mobile manners)
2. Effective presentation skills:
    - Delivering presentations with clarity and confidence
    - Focusing on kinesics and paralinguistic
3. Business etiquettes – dressing up, exchanging business cards, shaking hands, introducing oneself.
4. Email etiquette (Netiquette)
5. Technical report writing (purpose, planning, structure, preparation)
6. Business letter writing, interview cover letter, interview follow up letters, resume.
7. Group discussion (do’s and don'ts)
8. Life Skills:
    - Stress management
    - Decision making and problem solving
    - Assertiveness or self-control

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1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY2-24 / 2FY2-24: COMPUTER PROGRAMMING LAB

Credit: 1.5 **Max. Marks: 100 (IA: 60, ETE: 40)**

0L+0T+ 3P **End Term Exams: 3 Hours**

Course Objectives:

- To provide skills for designing flowcharts and writing algorithms.
- To introduce students to the field of programming using the C language
- To provide skills for writing C programs.
- To enable the students to debug programs.

Course Outcomes:

Upon successful completion of the course, the students will be able to

CO-1: Demonstrate an understanding of computer programming language concepts.

CO-2: Identify and abstract the programming task involved for a given problem.

CO-3: Design and develop modular programming skills.

CO-4: Trace and debug a program.

List of Experiments

1. Write a C program for printing "Hello, World!" on the terminal.
2. Write a C program to print your roll number, name, telephone number, and percentage (up to 2 decimals at least).
3. Write a C program to sum two numbers entered by the user.
4. Write a C program to Multiply Two Floating-Point Numbers entered by the user.
5. Write a C program to find the quotient and remainder when an integer is divided by another integer.
6. Write a C program for mathematical operations (i.e., Addition, Multiplication, Subtraction, Division, and Modulus Operator) on two numbers entered by the user.
7. Write a C program to find & print the Size of char, int, float, and double.
8. Write a C Program to Swap Two Numbers using the third number and without using the third number.
9. Write a C Program to Check Whether a Number entered by the user is Even or Odd.
10. Write a C Program to Check Whether a Character entered by the user is a Vowel or Consonant.
11. Write a C Program to Find the Largest Number Among Three Numbers entered by the user.
12. Write a C Program to Calculate the Sum of Natural Numbers.
13. Write a C Program to Find Factorial of a Number using looping and recursion.
14. Write a C Program to display the first 25 prime numbers and their sum.
15. Write a C Program to Display Fibonacci Sequence.
16. Write a C Program to Find LCM & GCD of two Numbers.
17. Write a C Program to Check Whether a String is Palindrome or Not.
18. Write a C program for mathematical operations by creating a function for Addition, Multiplication, Subtraction, Division, and Modulus operator and passing two numbers using value and reference.
19. Write a C Program to store ten numbers in an Array and display their index values and sum.
20. Write a C Program to Find Largest Element in a ten items Array.
21. Write a C Program to Find the Frequency of Characters in a String.
22. Write a C Program to Find the Length of a String.

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23. Write a C Program to Store Students' Information (name, five subject marks, telephone no., Percentage) Using Structure.
24. Write a C Program to Write a Sentence to a File.
25. Write a C Program to Read the First Line From a File.
26. Write a C Program to Print Pyramids and other Patterns.

Suggested Books:

1. H. M. Deitel and P. J. Deitel, C: How to program, 7th Edition, Pearson Education.
2. Briain W. Kernighan and Dennis Ritchie, C Programming Language, Prentice Hall of India.
3. Byron Gottfried, Programming with C, Tata McGraw Hill.
4. Herbert Schildt, The Complete Reference C, Tata McGraw Hill.
5. Yashwant Kanetkar, Let us C, BPB Publication.
6. B.A. Forouzan and R.F. Gilberg, A Structured Programming Approach in C, Cengage Learning.

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1st & 2nd Semester
Common to all branches of UG Engineering & Technology
1FY2-25 / 2FY2-25: MECHANICAL WORKSHOP PRACTICE

Credit: 3 **Max Marks: 100 (IA : 60, ETE: 40)**

0L+ 0T+ 3P **End Term Exams: 3hr**

Course Objectives:

- To inculcate basic understanding of practices of mechanical workshops and provide hands on experience in preparing simple jobs in various shops

Course Outcomes

Upon successful completion of the course the students will be able to

CO-1: Develop preliminary understanding of the procedures used in various sections of mechanical workshops.

CO-2: Understand importance of fitting shop and perform basic operations on a mild steel specimen.

CO-3: Develop basic understanding of procedures of welding shop and perform basic welding operations on a specimen.

CO-4: Understand basic concepts of foundry shops and prepare molds for simple machine components.

CO-5: Understand working of a lathe machine and perform simple operations such as facing, turning, chamfering etc.

CO-6: Understand the basic procedures of a carpentry shop and prepare simple joints using carpentry tools.

S. No.	Contents
1	**Introduction to workshop** • Workshop layout. • Importance of various sections/shops of workshop. • Types of jobs done in each shop. • General safety rules and work procedure in workshop
2	**Fitting Shop:** • Use of personal protective equipment and safety precautions while working. Holding and marking tools: work holding tools-bench vice, V-block with clamp, C-clamp, surface plate, angle plate, universal scribing block, try-square, scriber, divider, centre punch, letter punch, callipers, vernier, etc. • Introduction to cutting and finishing tool: material, applications and methods of using hacksaw, chisels, twist drill, taps, files, dies finishing tools- different files, reamers. • Introduction to miscellaneous tools: Specification and applications of miscellaneous tools-hammer, spanners, screw drivers, sliding screw wrench, etc. Demonstration of various fitting operations **Job Practice** **Job I:** Marking of job, use of marking tools, filing and use of measuring instruments; vernier calliper, micrometer and vernier height gauge. **Job II:** Filing a rectangular/square piece to maintain dimensions within an accuracy of 0.25 mm. **Job III:** Making a cut-out from a square piece of MS flat using hand hacksaw and chipping **Job IV:** Drilling and tapping practice on MS Flat.
3	**Welding Shop** • Types, specification, material and applications of arc welding and gas welding, accessories and consumables, tools used in welding, material. • Demonstration of metal joining operations; arc welding, soldering and brazing. Effect of current and speed. Also demonstrate various welding positions. Demonstration of gas cutting **Job Practice** **Job I:** Lap joint by gas welding **Job II:** Butt joint by arc welding **Job III:** Lap joint by arc welding

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4	**Foundry Shop** • Study of the various foundry tools • Study of the various foundry sands • Study of various furnaces: cupola, electric, oil fired and pit furnace **Job Practice** **Job I:** To prepare green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould) **Job II:** Casting of non-ferrous (lead or aluminium)
5	**Machine Shop** • Study of lathe machine; specification, parts, tools and accessories used with material and specification. • Study of various operations performed on the lathe machine. • Study of quick return mechanism of shaper. • Study of drilling, turret and capstan lathe **Job Practice** **Job I**: To prepare a job as per the given drawing (included facing, turning, step turning, and knurling,). **Job II:** To prepare a job as per the given drawing (included taper turning, grooving, drilling, and threading).
6	**Carpentry:** • Types, specification, material, applications and methods of using of carpentry tools-saws, planner, chisels, hammers, pallet, marking gauge, vice, try square, rule, etc. • Types of woods and their applications • Types of carpentry hardware's and their uses. • Demonstration of carpentry operations such as marking, sawing, planning, chiselling, grooving, boring, joining, etc. hardware's and their uses. **Job Practice** **Job I:** Preparation of wooden joints (T, lap, bridle, and motorize joint)

Suggested Books

1. S. K Hajra, Choudhary and A. K Choudhary, Workshop Technology I, II, III, Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Manchanda, Workshop Technology Vol. I, II, III by; India Publishing House, Jalandhar.
3. S.S. Ubhi, Workshop Training Manual, Vol. I, II, Katson Publishers, Ludhiana.
4. K. Venkata Reddy, Manual on Workshop Practice, MacMillan India Ltd., New Delhi.
5. T Jeyapoovan, Basic Workshop Practice Manual, Vikas Publishing House (P) Ltd., Delhi.
6. B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and Co., New Delhi.
7. H.S. Bawa, Workshop Technology, Tata McGraw Hill Publishers, New Delhi.

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1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY2-26 / 2FY2-26: BUILT ENVIRONMENT PRACTICES

Credit: 1	**Max. Marks: 100 (IA: 60, ETE: 40)**
0L+0T+ 2P	**End Term Exams: 3 Hours**

Course Objectives:

- To understand the importance of built environment
- To enhance the understanding of future engineers about significance of field conditions
- To provide the basic knowledge of water, sewage and air quality parameters

Course Outcomes:

CO-1: The course will help the students to have first level of understanding of role and responsibilities of engineers, in general, towards making a built environment with less energy footprints and at the same time more sustainable and green.

Contents

Part A: Field Knowledge and Practices

a) Invited lecture series from industry persons
b) Visit to nearby infrastructures (bridges, tunnels, dams, underground facilities)
c) Visit to nearby ongoing construction sites
d) Visit to nearby water/sewage treatment plan

Part B: Lab Exercises, covering the following:

a) Identification of soils and aggregates
b) Understand the water and waste water sampling, their quality standards by performing experiments on physical, chemical, and biological characteristics
c) Assess the air quality monitoring indicators (Particulate Matter - PM10 and PM2.5, CO2, VOC, Radon, and others) and their safe limits for indoor and outdoor air quality.
d) Brief teaching and demonstration state-of-the-art on remote sensing study

Suggested Books:

1. Manual on Water Supply and Treatment – CPHEEO.
2. Standard Methods for the Examination of Water and Wastewater, 21st Edition, Washington: APHA.
3. C. N. Sawyer, P. L. McCarty and G.F. Perkin, Chemistry for Environmental Engineering and Science, 5th Ed. McGraw-Hill Inc.
4. B. Kotaiah and N. Kumara Swamy, Environmental Engineering Laboratory Manual, 1st Ed Charotar Publishing House Pvt. Ltd.
5. Charles D Ghilani and Paul R Wolf., Elementary Surveying, Prentice Hall.
6. M. L. Gambhir and Neha Jamwal, Building and Construction Materials, Testing and Quality Control, Lab Manual, McGraw-Hill Inc.

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1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY2-27 / 2FY2-27: BASIC ELECTRICAL ENGINEERING LABORATORY

Credit: 1 **Max. Marks: 100 (IA: 60, ETE: 40)**

0L+0T+ 2P **End Term Exams: 3 Hours**

Course Objectives:

- Electrical workshop practice is also important since it generates confidence in the students to work on the electric equipments.
- General workshop practices are included in the curriculum in order to provide hands-on experience about use of different instruments and electrical equipments.
- Aims to develop general skills in the students about the domestic electric equipments like electric iron, various lamps, tube-light and house wiring.
- Develop the ability in the students to identify and test the basic electrical and electronic components.

Course Outcomes:

Upon successful completion of the course the students will be able to

CO-1: Understand the different meters and instruments for measurement of electrical quantities.

CO-2: Know about the working principles of Fluorescent Lamp, Sodium Vapour Lamp and Halogen Lamp.

CO-3: Understand about the different types of connections of auto-transformer and transformer.

CO-4: Demonstrate and hands on practice on basic electronic components and circuits.

CO-5: Identify and test the resistors, inductors, capacitors, PN-junction diode. Zener diode, LED, LCD, BJT, Photo Diode and Photo Transistor.

S. No.	List of experiments
1	Basic safety precautions. Basic functional study of main components used in Electrical and Electronics Engineering. Introduction and use of measuring instruments–Voltmeter, Ammeter, Analog/Digital multi-meter, Oscilloscope, Function/Signal Generator.
2	Assemble house wiring including earthing for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions.
3	Prepare the connection of ceiling fan along with the regulator and vary the speed.
4	Prepare the connection of Fluorescent Lamp, Sodium Vapour Lamp and Halogen Lamp and measure voltage, current and power in their circuits.
5	Study the construction and connection of single-phase transformer and auto-transformer. Measure input and output voltage and find the turn ratio.
6	Identification, testing and application of Resistors, Inductors, Capacitors, PN-Diode. Zener Diode, LED, LCD, BJT, Photo Diode and Photo Transistor.
7	Study the construction and basic working of SCR with its characteristics.
8	Measure the frequency and magnitude of voltage, current with the help of CRO.
9	Assemble the single-phase half wave and full wave bridge rectifier and analyse the effect of L, C and L-C filters in these rectifiers.
10	Study the BJT amplifier in common emitter configuration. Measure voltage gain, plot gain frequency response and calculate its bandwidth

1st & 2nd Semester

Common to all branches of UG Engineering & Technology

1FY2-28 : ENGINEERING VISUALIZATION

Credit: 1.5 **Max. Marks: 100 (IA: 60, ETE: 40)**
0L+0T+ 3P **End Term Exams: 3 Hours**

Course Objectives:

- To build the foundations for engineering visualization by familiarizing the students with engineering drawings and tools/instruments of practice.
- To explain the purpose, procedures, materials, and conventional symbols of drawing used in industries.
- To inculcate among students the first level skill of 3D modelling using Computer Packages
- To enable the students, create and read professional engineering drawings according to modern practices

Course Outcomes:

Upon successful completion of this course students will be able to

CO-1: Create 3D models for their (future) designs
CO-2: Create and read professional engineering drawings
CO-3: Visualize the product in various ways

S. No.	Contents
1	Introduction to Engineering Drawing/Graphics/Visualization a) Engineering Drawing as 'language of engineers' (for communication between engineering teams within a project) b) Motivation for the course: • Various fields of engineering (*e.g.*, Electrical, Mechanical, Civil) develop different products as their end goals • The product designs are based on analyses and numerical calculations • Manufacturers then develop/build the product based on the designs • A clear communication link required between the engineers/designers and manufacturers • The communication is made through engineering drawing c) Examples of 'Drawing' and 'Engineering Drawing' from different fields; Need for Engineering Drawing d) Drawing tools: Hand sketches/drafting, Computer packages (SOLIDWORKS by Dassault Systèmes, AutoCAD from AUTODESK etc) Drawing THEN and NOW: Glimpses (photos) of hand drawing instruments/tools (Drawing board, Mini Drafter, Compass and divider, Set squares and protractor, French curves, Pencils and eraser etc.); Grades of Pencils in drawing (9H to H, F, HB, B to 7B); Glimpses of modern computer drawing packages (Catia, AutoCAD, SOLIDWORKS, Creo, Onshape, Fusion 360)
2	Rules of Engineering Drawing: a) For Lines: Various thick, thin and dashed lines (center line, hidden line, outline, dimension line, extension line/projection line, construction line, leader line, section line, cutting-plane line, long-break line, short-break line, locus line) Showing them all in a simple drawing

	b) Dimensioning: Types, Rules for dimensioning Scale: Enlargement and Reduction scale, Definitions of Engineer's scale, Graphical scale, and Representative Fraction
3	Introduction to concept of Projection, Need for Projection (for showing 3D object on 2D plane) a) Simple example of projection b) Types of projections (system): Orthographic, Isometric, Oblique, Perspective c) Orthographic Projections: As most used system due to true size and true shape d) Principles of projection e) First angle and Third angle projection systems f) Projection Planes (Vertical Plane, Horizontal Plane, Auxiliary Plane) Projection of Point (exercise in sketchbook)
4	Drawing sheets a) Drawing papers • In India, as per BIS SP:46 (2003): ISO A5, A4, A3, A2, A1, A0 • Elsewhere such as in USA: ANSI A, B, C, and D (which are multiples of 'letter size') b) General suggestion for drawing sheet borders, margins and boxes Projection of lines (brief simple examples for understanding the concept of projection) Introduction to solids: a) Polyhedrons (regulars and prisms) and b) Solids of revolutions
5	Projection of solids (brief simple examples for understanding the concept of projection), Draw simple solid in 3D CAD package and show its projections and cutting planes
6	2D Drawing demonstration of state-of-the-art (simple objects as 'Parts') a) Simple drawing creations, covering the following: • Generate reference planes • Simple sketching on planes: Points, Lines, Construction lines, Circles, Circular Arcs, Polygons • Simple sketching operations: Dimension, Fillet, Trim, Extend, Split, Offset, Linear or Circular (copy/move) pattern • Simple sketching constraints: Horizontal, Vertical, Parallel, Perpendicular, Concentric, Tangent, Equal, Midpoint, Normal, Pierce etc. • Parametric drawing concept Well constrained drawing
7	3D Solid modelling demonstration of state-of-the-art (simple objects as 'Parts') a) Simple model creations, covering the following: • Basic drawing in a plane • Extrude, Revolve, Sweep, Loft, Thicken, operations b) Export drawings (from the solid model) to be sent out to the manufacturer: Select the type of sheet and select the system of projection (1st angle or 3rd angle projection) Create projected views, Dimensioning in projected views, Multiple views in the drawing (isometric, front view, top view and side view), Dimensioning rules must be adhered in the four drawing views
8	3D Solid modeling demonstration of state-of-the-art (complex objects as 'Parts') a) Mirror and Pattern commands: linear patterns, circular patterns b) Fillets, Rib, Draft operations

	c) Project operation (of curves on faces/planes) d) Boolean operations e) Helix path creation Sheet metal creation
9	Sectioning of Parts a) Need for sectioning (to reveal hidden details, which are otherwise not supplied by the usual four views (isometric, FV, TV, SV) b) Types of Sections: c) Sectioning lines types (as per BIS SP:46-2003): d) Creating sectional views • Define arbitrary section plane in exported Drawing view of the Part Take section at arbitrary plane in Drawing view
10	Assembly of Parts a) Controlling Part color and transparency b) Inserting Parts into Assembly c) Part Translation d) Assigning suitable Mate Connectors on Parts e) Mates on Parts: Fastened Mate, Revolute Mate, Slider Mate, Planar Mate, Cylindrical Mate, Pin-Slot Mate, Ball-Mate, Parallel Mate, Tangent Mate. Identification of a most suitable mate for a particular connection in assembly, Explore mate restraint limits in assembly, Mate constraints

Course Exercises using any Computer Packages

Week No.	**Topic**	**Assignment problems cover the following**	**Marks**
Week 1	Projection of points	Drawing projection of points in a SKETCH BOOK or A4 sheet by hand.	2
Week 2	Projection of lines	Projection of lines on three planes in a SKETCH BOOK or A4 sheet by hand and draw the views and project the lines. Basic Drawing Commands, provides an overview of the basic drawing commands such as LINE and CIRCLE to create a simple drawing.	2
Week 3	3D solid model	First hand practice on making 3D models of objects like a cube block, cylinder, cone etc. I. Given the four views (Front View, Side View, Top View and isometric view) II. Given the isometric view only with all minimum required dimensions of the object Use simple drawing commands.	3
Week 4	2D and 3D drawing	Practice of making well constrained 2D drawings, and also a few 3D models (Practice Extrude ADD or Extrude CUT commands, and Application of Revolve command) Standard dimensioning, Basic modelling tools (layers, colors, selection, transformation, offset, array, and etc), Modify dimension style.	3
Week 5	Advanced 3D model	Modelling Solids with 3D Sketches and bit more advanced operations for modelling (use of Extrude CUT, Extrude up to specified Face, Revolve Cut, 3D sketching, Sweep, Rib, Loft, Draft etc. commands).	3
Week 6	Projection of solids	Drawing the projection of given objects on specified planes (HP, VP or AP) in specified projection system (1st or 3rd angle).	4

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		Given the isometric view of the object, make the corresponding solid model in your computer package, and then export the drawing of the Part model on the specified plane and in specified angle projection system	
Week 7	Isometric views from projections	Create isometric views from 2D drawings and associated visualization. A minimum and sufficient number of 2D views of objects will be given to describe them correctly in each problem. First visualize the 3D object, draw it on sketchbook, and then make the 3D model. As a last step, generate the isometric view of the modelled object. Now export the same projected views from generated 3D model and verify these views against the given views in the problems to ascertain that model was formed correctly. This exercise is the reverse exercise taking place on the manufacturer's side, when the design is obtained from the designer firm.	4
Week 8	Sectional views	I. More practice on: Given the orthographic projections, imagine (deriving logically) the 3D object and then sketch it in sketch book. Make a CAD model, project the views and try to compare them with given views for correctness of your 3D model. II. Draw the sectional views of the given object for different section lines. Use objects prepared in previous exercises.	3
Week 9	Dimensioning and Detailed Drawing	Prepare a professional complete drawing ready to go to the manufacturer. For this, a 3D model (source Parasolid or .stl file) of the designed part is already given. Make no dimensioning or detailing mistakes. *May also create a bill of materials; use external references and create multiview layouts.*	4
Week 10	Assembly, and Assembly Drawings	Make a complete assembly using multiple constituent parts to render a consolidated product. Simple assemblies like steel A-frame with welded beam-column joints, an isolated roadside street-light pole/lamp-post with base plate, a swing for children in the park, a grillage footing or a piston-cylinder assembly (all with complete relevant constraints) can be included in this exercise.	5
Week 11,12	Assembly, and Assembly Drawings	Exercise related to a complete assembly of any product such as a Pin Stapler, a small induction motor, a backhoe, an RCC beam with all reinforcement, a metal chain with links, or a skateboard etc.	5
Week 13,14	Efficient Modelling and Parameterization: Assembly and Assembly Drawings	This exercise is dedicated to refine the modelling practice, with an emphasis on minimal number of steps and efficient modelling, in the following aspects: a) The Geometry in Sketches and modelling of parts, b) The Mates in the Assembly, c) The settings of mate restraint limits such that "a parametric change does not break anything" in the model and such that the limits are consistent enough to render the model as realistic as possible. The following problems may be considered (or any other that the instructors consider appropriate): a) Springs in series with Pin-Slot mate connections, b) A propeller c) A bike rear shock-absorber (simple spring-rod type), d) a table with foldable legs etc.	7

Suggested Books

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2014
2. D. K. Lieu and S. Sorby, Visualization, Modeling, and Graphics for Engineering Design, Cengage Learning, 2015
3. D. C. Planchard, M. P. Planchard, Engineering Graphics with SolidWorks (A Step-by-Step

Project Based Approach), SDC Publications, 2013

4. E. Finkelstein, “AutoCAD 2007 Bible”, Wiley Publishing Inc., 2007
5. Onshape Forums online: https://forum.onshape.com/

1st & 2nd Semester

Common to all branches of UG Engineering & Technology

2FY2-29: COMPUTER AIDED MACHINE DRAWING

Credit: 3 **Max Marks: 100 (IA : 60, ETE: 40)**

0L+ 0T+ 3P **End Term Exams: 3hr**

Course Objectives:

- To impart preliminary understanding of machine drawing and concepts along with introduction of various mechanical components used in engineering applications.
- Develop an understanding for size specification procedures and use of SI and traditional units of linear measure.

Course Outcomes:

Upon successful completion of the course the students will be able to

CO-1: Understand basic concepts of machine drawing and draw orthographic views of simple machine components.

CO-2: Understand and visualize importance of various fasteners used in daily life along with applications of different mechanical components and draw them fee hand.

CO-3: Develop preliminary understanding of CAD software and use various commands to draw orthographic and isometric views of simple machine components.

S. No.	Contents	Hours
1	**Introduction:** Principles of drawing, conventional representation of machine components and materials, lines, types of lines, elements of dimensioning - systems of dimensioning.	
2	**Conventional representations:** Standard convention using SP-46 (1988)-Materials C.I., M.S., Brass, Bronze, Aluminum, wood, Glass, Concrete and Rubber-Long and short break in pipe, rod and shaft. Various sections- half, removed, standard convention of knurling, splined shafts, and chain wheels. springs with square and flat ends, gears, sprocket wheel-countersunk & counter bore.	
3	**Conversion of pictorial views into orthographic views**: Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing view problems covering principles of orthographic projections.	
4	**Sectional views of mechanical components:** Introduction, cutting plane line, type of sectional views-full section, half section, partial or broken section, revolved section, removed section, offset section, sectioning conventions-spokes, web rib, shaft, pipes, different types of holes, conventions of section lines for different metals and materials.	
5	**Overview of Computer Graphics:** Review of graphic interface of the software-CAD, review of basic sketching commands and navigational commands, starting a new drawing sheet with various sizes, toolbars, dialog boxes and windows, shortcut menus, command line, select and erase objects, isometric views of lines, planes, simple and compound solids, pictorial views into orthographic projections of simple machine parts.	
6	**Drawing standards & fits and tolerances:** Code of practice for engineering drawing, BIS specifications -welding symbols, riveted joints, keys, fasteners–reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. Limits, Fits, Tolerance of individual dimensions. Specification of fits-preparation of production drawings and reading of part and assembly drawings, basic	

	principles of geometric dimensioning & tolerancing.	
	Total	**30**

Suggested Books

1. L. Mathur, A Textbook of Machine Drawing, Publisher: Jain Brothers.
2. K. R. Gopala Krishna, Machine Drawing, Subhas Publishers, Bangalore.
3. P. Kumar, Basic Mechanical Engineering, Pearson Education India.
4. K. L. Narayana, Machine Drawing, New Age International publishers.
5. K. C. John, Textbook of Machine Drawing, PHI.
6. N. D. Bhatt, Machine Drawing, Charotar Publication, Anand.
7. Sidheshwar, Machine Drawing, Tata McGraw Hill
8. L. K. Narayanan and P. Kannaich, Production Drawing, New Age International Publication.
9. Code of Practice for General Engineering-IS Code SP 46 (1988)- Engineering Drawing Practice for School and Colleges

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2nd Semester

Common to all branches of UG Engineering & Technology

2FY1-01:ENGINEERING MATHEMATICS-2

Credit: 3 **Max. Marks: 100 (IA: 30, ETE: 70)**

3L+1T+ 0P **End Term Exams: 3 Hours**

Course Objectives:

- To provide essential knowledge of basic tools of Integral calculus, Vector calculus, three dimensional coordinate geometry and Matrices for degree students of engineering and technology.
- To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from engineering fields.

Course Outcomes:

CO-1: Able to solve problems based on surface and volume integrals, gradient, divergence, curl and other operators, sphere, cone, cylinder, etc..

CO-2: Come to know about the Matrices and its applications also able to apply the principles of matrix algebra and calculus to address problems in their disciplines.

S. No	Contents	Hours
1	**Integral Calculus**: Surface and Volumes of Solids of Revolution, Double Integral, Double Integral by changing into polar form, Areas & Volumes by Double Integration, Change of Order of Integration, Beta Function and Gamma Function (Simple Properties).	12
2	**Vector Calculus**: Scalar and vector field, differentiation & integration of vector functions, Gradient, Divergence, Curl and Differential Operator, Line, Surface and volume Integrals.	6
3	**Application of Vector Calculus**: Green's Theorem in a Plane, Gauss's and Stoke's Theorem (without proof) and their Applications.	4
4	**Coordinate Geometry of Three Dimensions**: Equation of a sphere, Intersection of a sphere and a plane, tangent plane, Intersection of two spheres, orthogonality of two spheres, Right circular cone. Right circular cylinder.	8
5	**Matrices**: Rank of a matrix, Rank of matrix by reducing to normal forms, Consistency of systems of linear simultaneous equations and its solution, Eigen values and Eigen vectors, Cayley- Hamilton theorem (without proof), Diagonalization of matrix.	10
	Total	**40**

Suggested Books:

1. Peter V O' Neil, Advanced Engineering Mathematics, Cengage Learning Publication, 7th Edition.
2. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones & Bartlett, 4thEdition.
3. George B. Thomas, Joel Hass and Christopher Heil, Thomas' Calculus, Pearson, 14th Edition.
4. R. K. Jain and S.R.K. Iyengar , Advanced Engineering Mathematics, , Narosa Publications, 5th Edition.
5. B.V. Ramana , Higher Engineering Mathematics, McGraw Hill Education.
6. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley.

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