Scheme and Syllabus

B.Tech. in CSE-AI

(For Students admitted since 2021)

Semester – I & II

Teaching and Examination Scheme

I Semester: B. Tech
Common to all branches of UG Engineering & Technology

SN	Category	Course Code	Course Title	Hours			Marks			Cr
				L	T	P	IA	ETE	Total	
1	BSC	1FY2-01	Engineering Mathematics-I	3	1	-	30	70	**100**	**4**
2	BSC	1FY2-02/ 1FY2-03	Engineering Physics/ Engineering Chemistry	3	1	-	30	70	**100**	**4**
3	HSMC	1FY1-04/ 1FY1-05	Communication Skills/ Human Values	2	-	-	30	70	**100**	**2**
4	ESC	1FY3-06/ 1FY3-07	Programming for Problem Solving/ Basic Mechanical Engineering	2	-	-	30	70	**100**	**2**
5	ESC	1FY3-08/ 1FY3-09	Basic Electrical Engineering/ Basic Civil Engineering	2	-	-	30	70	**100**	**2**
6	BSC	1FY2-20/ 1FY2-21	Engineering Physics Lab/ Engineering Chemistry Lab	-	-	2	60	40	**100**	**1**
7	HSMC	1FY1-22/ 1FY1-23	Language Lab/ Human Values Activities and Sports	-	-	2	60	40	**100**	**1**
8	ESC	1FY3-24/ 1FY3-25	Computer Programming Lab/ Manufacturing Practices Workshop	-	-	3	60	40	**100**	**1.5**
9	ESC	1FY3-26/ 1FY3-27	Basic Electrical Engineering Lab/ Basic Civil Engineering Lab	-	-	2	60	40	**100**	**1**
10	ESC	1FY3-28/ 1FY3-29	Computer Aided Engineering Graphics/ Computer Aided Machine Drawing	-	-	3	60	40	**100**	**1.5**
11	SODECA	1FY8-00							**100**	**0.5**
									Total	**20.5**

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

Teaching and Examination Scheme

II Semester: B.Tech.
Common to all branches of UG Engineering & Technology

SN	Category	Course Code	Course Title	Hours			Marks			Cr
				L	T	P	IA	ETE	Total	
1	BSC	2FY2-01	Engineering Mathematics-II	3	1	-	30	70	**100**	**4**
2	BSC	2FY2-03/ 2FY2-02	Engineering Chemistry/ Engineering Physics	3	1	-	30	70	**100**	**4**
3	HSMC	2FY1-05/ 2FY1-04	Human Values/ Communication Skills	2	-	-	30	70	**100**	**2**
4	ESC	2FY3-07/ 2FY3-06	Basic Mechanical Engineering/ Programming for Problem Solving	2	-	-	30	70	**100**	**2**
5	ESC	2FY3-09/ 2FY3-08	Basic Civil Engineering/ Basic Electrical Engineering	2	-	-	30	70	**100**	**2**
6	BSC	2FY2-21/ 2FY2-20	Engineering Chemistry Lab/ Engineering Physics Lab	-	-	2	60	40	**100**	**1**
7	HSMC	2FY1-23/ 2FY1-22	Human Values Activities and Sports/ Language Lab	-	-	2	60	40	**100**	**1**
8	ESC	2FY3-25/ 2FY3-24	Manufacturing Practices Workshop/ Computer Programming Lab	-	-	3	60	40	**100**	**1.5**
9	ESC	2FY3-27/ 2FY3-26	Basic Civil Engineering Lab/ Basic Electrical Engineering Lab	-	-	2	60	40	**100**	**1**
10	ESC	2FY3-29/ 2FY3-28	Computer Aided Machine Drawing/ Computer Aided Engineering Graphics	-	-	3	60	40	**100**	**1.5**
11	SODECA	2FY8-00							**100**	**0.5**
									Total	**20.5**

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SYLLABUS
I Semester
Common to all branches of UG Engineering & Technology

1FY2-01: Engineering Mathematics-I

SN	CONTENTS
1	**Calculus:** Improper integrals (Beta and Gamma functions) and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.
2	**Sequences and Series:** Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.
3	**Fourier Series:** Periodic functions, Fourier series, Euler's formula, Change of intervals, Half range sine and cosine series, Parseval's theorem.
4	**Multivariable Calculus (Differentiation):** Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.
5	**Multivariable Calculus (Integration):** Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY2-02/ 2FY2-02: Engineering Physics

SN	CONTENTS
1	**Wave Optics:** Newton's Rings, Michelson's Interferometer, Fraunhofer Diffraction from a Single Slit. Diffraction grating: Construction, theory and spectrum, Resolving power and Rayleigh criterion for limit of resolution, Resolving power of diffraction grating, X-Ray diffraction and Bragg's Law.
2	**Quantum Mechanics:** Introduction to quantum Mechanics, Wave-particle duality, Matter waves, Wave function and basic postulates, Time dependent and time independent Schrodinger's Wave Equation, Physical interpretation of wave function and its properties, Applications of the Schrodinger's Equation: Particle in one dimensional and three dimensional boxes.
3	Coherence and **Optical Fibers:** Spatial and temporal coherence: Coherence length; Coherence time and 'Q' factor for light, Visibility as a measure of Coherence and spectral purity, Optical fiber as optical wave guide, Numerical aperture; Maximum angle of acceptance and applications of optical fiber.
4	**Laser:** Einstein's Theory of laser action; Einstein's coefficients; Properties of Laser beam, Amplification of light by population inversion, Components of laser, Construction and working of He-Ne and semiconductor lasers, Applications of Lasers in Science, engineering and medicine.
5	**Material Science & Semiconductor Physics:** Bonding in solids: covalent and metallic bonding, Energy bands in solids: Classification of solids as Insulators, Semiconductors and Conductors, Intrinsic and extrinsic semiconductors, Fermi dirac distribution function and Fermi energy, Conductivity in semiconductors, Hall Effect: Theory, Hall Coefficient and applications.
6	**Introduction to Electromagnetism:** Divergence and curl of electrostatic field, Laplace's and Poisson's equations for electrostatic potential, Bio-Savart law, Divergence and curl of static magnetic field, Faraday's law, Displacement current and magnetic field arising from time dependent electric field, Maxwell's equations, Flow of energy and Poynting vector.

I & II Semester

Common to all branches of UG Engineering & Technology

1FY2-03/ 2FY2-03: Engineering Chemistry

SN	CONTENTS
1	**Water:** Common impurities, hardness, determination of hardness by complexometric (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, Priming and Foaming, Boiler corrosion and Caustic embrittlement Water softening; Lime-Soda process, Zeolite (Permutit) process, Demineralization process. Numerical problems based on Hardness, EDTA, Lime-Soda and Zeolite process.
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, Mining, Refining and Composition of petroleum, Cracking, Synthetic petrol, Reforming, Knocking, Octane number, Anti-knocking agents, Cetane number 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 Numerical problems based on determination of calorific value (bomb calorimeter/Junkers calorimeter/Dulongs formula, proximate analysis & ultimate and combustion of fuel.
3	**Corrosion and its control:** 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 and modifications in design.
4	**Engineering Materials:** Portland Cement; Definition, Manufacturing by Rotary kiln. Chemistry of setting and hardening of cement. Role of Gypsum. Glass: Definition, Manufacturing by tank furnace, significance of annealing, Types and properties of soft glass, hard glass, borosilicate glass, glass wool, safety glass Lubricants: Classification, Mechanism, Properties; Viscosity and viscosity index, flash and fire point, cloud and pour point. Emulsification and steam

	emulsion number.
5	**Organic reaction mechanism and introduction of drugs:** Organic reaction mechanism: Substitution; SN1, SN2, Elecrophilic aromatic substitution in benzene, free radical halogenations of alkanes, Elimination; elimination in alkyl halides, dehydration of alcohols, Addition: electrophilic and free radical addition in alkenes, nucleophilic addition in aldehyde and ketones, Rearrangement; Carbocation and free radical rearrangements Drugs: Introduction, Synthesis, properties and uses of Aspirin, Paracetamol

I & II Semester
Common to all branches of UG Engineering & Technology

1FY1-04/ 2FY1-04: Communication Skills

SN	CONTENTS
1	**Communication:** Meaning, Importance and Cycle of Communication. Media and Types of Communication. Verbal and Non-Verbal Communication. Barriers to communication. Formal and Informal Channels of Communication (Corporate Communication). Divisions of Human Communication and Methods to improve Interpersonal Communication. Qualities of good communication.
2	**Grammar:** Passive Voice. Reported Speech. Conditional Sentences. Modal Verbs. Linking Words (Conjunctions)
3	**Composition:** Job Application and Curriculum-Vitae Writing. Business Letter Writing. Paragraph Writing. Report Writing.
4	**Short Stories:** "Luncheon" by Somerset Maugham ."How Much Land Does a Man Need?" by Count Leo Tolstoy. "The Night Train at Deoli" by Ruskin Bond.
5	**Poems:** "No Men are Foreign" by James Kirkup. "If" by Rudyard Kipling. "Where the Mind is without Fear" by Rabindranath Tagore.

I & II Semester

Common to all branches of UG Engineering & Technology

1FY1-05/ 2FY1-05: Human Values

SN	CONTENTS
1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** Understanding the need, basic guidelines, Self Exploration - its content and process; 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facilities, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels
2	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha Understanding the Body as an instrument of 'I',Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.
3	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) , meaning of Vishwas; Difference between intention and competence, meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, harmony in the society , Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals ,Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family.
4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all pervasive Space. Holistic perception of harmony at all levels of existence

5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values** Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, (b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models. Strategy for transition from the present state to Universal Human Order: (a). At the level of individual: as socially and ecologically responsible engineers, technologists and managers. (b). At the level of society: as mutually enriching institutions and organization. Case studies related to values in professional life and individual life.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-06/ 2FY3-06: Programming for Problem Solving

SN	CONTENTS
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, Representing algorithms through flowchart and pseudo code.
2	**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.
3	**C Programming:** Problem specification, flow chart, data types, assignment statements, input output statements, developing simple C programs, If statement, for loops, while loops, do-while loops, switch statement, break statement, continue statement, development of C programs using above statements, Arrays, functions, parameter passing, recursion, Programming in C using these statements, Structures, files, pointers and multi file handling.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-07/ 2FY3-07: Basic Mechanical Engineering

SN	CONTENTS
1	**Fundamentals:** Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology. Steam Boilers classification and types of steam boilers and steam turbines. Introduction and Classification of power plants.
2	**Pumps and IC Engines:** Applications and working of Reciprocating and Centrifugal pumps. Introduction, Classification of IC Engines, Main Components of IC Engines, Working of IC Engines and its components.
3	**Refrigeration and Air Conditioning:** Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning.
4	**Transmission of Power:** Introduction and types of Belt and Rope Drives, Gears.
5	**Primary Manufacturing Processes:** Metal Casting Process: Introduction to Casting Process, Patterns, Molding, Furnaces. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering.
6	**Engineering Materials and Heat Treatment of Steel:** Introduction to various engineering materials and their properties.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-08/ 2FY3-08: Basic Electrical Engineering

SN	CONTENTS
1	**DC Circuits:** Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, Series-Parallel circuits, Node voltage method, Mesh current method, Superposition, Thevenin's, Norton's and Maximum power transfer theorems.
2	**AC Circuits:** Representation of sinusoidal waveforms, peak and r.m.s values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC and RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.
3	**Transformers:** Ideal and practical transformer, EMF equation, equivalent circuit, losses in transformers, regulation and efficiency.
4	**Electrical Machines:** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Starting and speed control of induction motor, single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited DC motor. Construction and working of synchronous generators.
5	**Power Converters:** Semiconductor PN junction diode and transistor (BJT). Characteristics of SCR, power transistor and IGBT. Basic circuits of single phase rectifier with R load, Single phase Inverter, DC-DC converter.
6	**Electrical Installations:** Layout of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, Type of earthing. Power measurement, elementary calculations for energy consumption.
	TOTAL

I & II Semester

Common to all branches of UG Engineering & Technology

1FY3-09/ 2FY3-09: Basic Civil Engineering

SN	CONTENTS
1	**Introduction to objective, scope and outcome the subject**
2	**Introduction:** Scope and Specialization of Civil Engineering, Role of civil Engineer in Society, Impact of infrastructural development on economy of country.
3	**Surveying:** Object, Principles & Types of Surveying; Site Plans, Plans& Maps; Scales & Unit of different Measurements. Linear Measurements: Instruments used. Linear Measurement by Tape, Ranging out Survey Lines and overcoming Obstructions; Measurements on sloping ground; Tape corrections, conventional symbols. Angular Measurements: Instruments used; Introduction to Compass Surveying, Bearings and Longitude & Latitude of a Line, Introduction to total station. Levelling: Instrument used, Object of levelling, Methods of levelling in brief, Contour maps.
4	**Buildings:** Selection of site for Buildings, Layout of Building Plan, Types of buildings, Plinth area, carpet area, floor space index, Introduction to building byelaws, concept of sun light and ventilation. Components of Buildings & their functions, Basic concept of R.C.C., Introduction to types of foundation.
5	**Transportation:** Introduction to Transportation Engineering; Traffic and Road Safety: Types and Characteristics of Various Modes of Transportation; Various Road Traffic Signs, Causes of Accidents and Road Safety Measures.
6	**Environmental Engineering:** Environmental Pollution, Environmental Acts and Regulations, Functional Concepts of Ecology, Basics of Species, Biodiversity, Ecosystem, Hydrological Cycle; Chemical Cycles: Carbon, Nitrogen& Phosphorus; Energy Flow in Eco-systems. Water Pollution: Water Quality standards, Introduction to Treatment & Disposal of Waste Water. Reuse and Saving of Water, Rain Water Harvesting. Solid Waste Management: Classification of Solid Waste, Collection, Transportation and Disposal of Solid. Recycling of Solid Waste: Energy Recovery,Sanitary Land fill, On-Site Sanitation.

	Air& Noise Pollution: Primary and Secondary air pollutants, Harmful effects of Air Pollution, Control of Air Pollution. Noise Pollution, Harmful Effects of noise pollution, control of noise pollution, Global warming& Climate Change, Ozone depletion, Green House effect
	TOTAL

I & II Semester

Common to all branches of UG Engineering & Technology

1FY2-20/ 2FY2-20: Engineering Physics Lab

1. To determine the wave length of monochromatic light with the help of Michelson's interferometer.
2. To determine the wave length of sodium light by Newton's Ring.
3. To determine the wave length of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
4. Determination of band gap using a P-N junction diode.
5. To determine the height of given object with the help of sextant.
6. To determine the dispersive power of material of a prism with the help of spectrometer.
7. To study the charge and discharge of a condenser and hence determine the same constant (both current and voltage graphs are to be plotted.
8. To determine the coherence length and coherence time of laser using He – Ne laser.
9. To measure the numerical aperture of an optical fibre.
10. To study the Hall Effect and determine the Hall Voltage and Hall coefficients.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY2-21/ 2FY2-21: Engineering Chemistry Lab

1.	Determination the hardness of water by EDTA method
2.	Determination of residual chlorine in water
3.	Determination of dissolved oxygen in water
4.	Determination of the strength of Ferrous Ammonium sulphate solution with the help of K2Cr2O7 solution by using diphenyl amine indicator
5.	Determination of the strength of CuSO4 solution iodometrically by using hypo solution
6.	Determination of the strength of NaOH and Na2CO3 in a given alkali mixture
7.	Proximate analysis of Coal
8.	Determination of the flash & fire point and cloud & pour point of lubricating oil
9.	Determination of the kinematic viscosity of lubricating oil by Redwood viscometer no. 1 at different temperature
10.	Synthesis of Aspirin/ Paracetamol

I & II Semester
Common to all branches of UG Engineering & Technology

1FY2-22/ 2FY2-22: Language Lab

1. Phonetic Symbols and Transcriptions.
2. Extempore.
3. Group Discussion.
4. Dialogue Writing.
5. Listening comprehension.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY1-23/ 2FY1-23: Human Values Activities and Sports

PS 1:

Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your salient achievements and shortcomings in your life? Observe and analyze them.

PS 2:

Now-a-days, there is a lot of talk about many techno-genic maladies such as energy and material resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be manmade problems, threatening the survival of life Earth - What is the root cause of these maladies & what is the way out in opinion?

On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, breakdown of relationships, generation gap, depression & suicidal attempts etc. - what do you think, is the root cause of these threats to human happiness and peace - what could be the way out in your opinion?

PS 3:

1. Observe that each of us has the faculty of 'Natural Acceptance', based on which one can verify what is right or not right for him. (As such we are not properly trained to listen to our 'Natural Acceptance' and may a time it is also clouded by our strong per-conditioning and sensory attractions).

Explore the following:

(i) What is Naturally Acceptable' to you in relationship the feeling of respect or disrespect for yourself and for others?

(ii) What is 'naturally Acceptable' to you - to nurture or to exploit others?

Is your living in accordance with your natural acceptance or different from it?

2. Out of the three basic requirements for fulfillment of your aspirations - right understanding, relationship and physical facilities - observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

PS 4:

1. a. Observe that any physical facility you use, follows the given sequence with time:

Necessary and tasteful - unnecessary but still tasteful - unnecessary and tasteless - intolerable

b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If not acceptable, you want it continuously and if not acceptable, you do not want it any moment!

2. List down all your important activities. Observe whether the activity is of 'I' or of Body or with the participation of both or with the participation of both 'I' and Body.

3. Observe the activities within 'i'. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

PS 5:

1. Write a narration in the form of a story, poem, skit or essay to clarify a salient Human Value to the children.
2. Recollect and narrate an incident in your life where you were able to exhibit willful adherence to values in a difficult situation.

PS 6:

List down some common units (things) of Nature which you come across in your daily life and classify them in the four orders of Nature. Analysis and explain the aspect of mutual fulfillment of each unit with other orders.

PS 7:

Identify any two important problems being faced by the society today and analyze the root cause of these problems. Can these be solved on the basic of natural acceptance of human values? If so, how should one proceed in this direction from the present situation?

PS 8:

1. Suggest ways in which you can use your knowledge of Science/Technology/Management etc. for moving towards a universal human order.
2. Propose a broad outline for humanistic Constitution at the level of Nation.

Project:

Every student required to take-up a social project e.g. educating children in needy/weaker section; services in hospitals, NGO's and other such work i.e. social work at villages adopted by respective institute/ college.

Sports:

a) Planning in Sports,
b) Sports & Nutrition
c) Yoga and Life style
d) Measures Physical Education & Sports for CWSN (Children with Special needs - Divyang)
e) Children & Sports
f) Women & Sports
g) Test & Measurement in Sports
h) Physiology & Sports
i) Sports Medicine
j) Kinesiology, Biomechanics & Sports
k) Psychology & Sports
l) Training in Sports

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-24/ 2FY3-24: Computer Programming Lab

1.	To learn about the C Library, Preprocessor directive, Input-output statement.
2.	Programs to learn data type, variables, If-else statement
3.	Programs to understand nested if-else statement and switch statement
4.	Programs to learn iterative statements like while and do-while loops
5.	Programs to understand for loops for iterative statements
6.	Programs to learn about array and string operations
7.	Programs to understand sorting and searching using array
8.	Programs to learn functions and recursive functions
9.	Programs to understand Structure and Union operation
10.	Programs to learn Pointer operations
11.	Programs to understand File handling operations
12.	Programs to input data through Command line argument

I & II Semester

Common to all branches of UG Engineering & Technology

1FY3-25/ 2FY3-25: Manufacturing Practices Workshop

Carpentry Shop

1. T – Lap joint
2. Bridle joint

Foundry Shop

3. Mould of any pattern
4. Casting of any simple pattern

Welding Shop

5. Lap joint by gas welding
6. Butt joint by arc welding
7. Lap joint by arc welding
8. Demonstration of brazing, soldering & gas cutting

Machine Shop Practice

9. Job on lathe with one step turning and chamfering operations

Fitting and Sheet Metal Shop

10. Finishing of two sides of a square piece by filing
11. Making mechanical joint and soldering of joint on sheet metal
12. To cut a square notch using hacksaw and to drill a hole and tapping

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-26/ 2FY3-26: Basic Electrical Engineering Lab

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Transformers: Observation of the no-load current waveform on an oscilloscope. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
3. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).Phase-shifts between the primary and secondary side.
4. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
5. Torque Speed Characteristic of separately excited dc motor.
6. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

I & II Semester

Common to all branches of UG Engineering & Technology

1FY3-27/ 2FY3-27: Basic Civil Engineering Lab

1. Linear Measurement by Tape:
   a) Ranging and Fixing of Survey Station along straight line and across obstacles.
   b) Laying perpendicular offset along the survey line
2. Compass Survey: Measurement of bearing of linesusing Surveyor's and Prismatic compass
3. Levelling: Using Tilting/ Dumpy/ Automatic Level
   a) To determine the reduced levels in closed circuit.
   b) To carry out profile levelling and plot longitudinal and cross sections for road by Height of Instrument and Rise & Fall Method.
4. To study and take measurements using various electronic surveying instruments like EDM, Total Station etc.
5. To determine pH, hardness and turbidity of the given sample of water.
6. To study various water supply Fittings.
7. To determine the pH and total solids of the given sample of sewage.
8. To study various Sanitary Fittings.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-28/ 2FY3-28: Computer Aided Engineering Graphics

Introduction: Principles of drawing, lines, type of lines, usage of Drawing instruments, lettering, Conic sections including parabola, hyperbola, Rectangular Hyperbola (General method only); Scales-Plain, Diagonal and Vernier Scales.

Projections of Point & Lines: Position of Point, Notation System, Systematic Approach for projections of points, front view & Top view of point, Position of straight lines, line parallel to Both the RPs, Line perpendicular to either of the RPs, Line inclined to one RP and parallel to the other, Line inclined to Both the RPs, Traces of a line (One drawing sheet, one assignment in sketch book).

Projection of Planes: Positions of planes, Terms used in projections of planes, plane parallel to RP, plane inclined to one RP and perpendicular to the other RP, plane perpendicular to Both the RPs, plane Inclined to Both the RPs, True shape of the plane, Distance of a point from plane, Angle between two planes.

Projections of Regular Solids: frustum and truncated solids, those inclined to both the Planes-Auxiliary Views.

Section of Solids: Theory of sectioning, section of prisms and cubes, section of pyramids and Tetrahedron section of Cylinders, section of cones, section of spheres (One drawing sheet, one assignment in sketch book)

Overview of Computer Graphics : Covering theory of CAD software [such as: The menu System, Toolbars (standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of lines, Planes, Simple and compound Solids.

I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-29/ 2FY3-29: Computer Aided Machine Drawing

Introduction: Principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, rules of dimensioning.

Conversion of pictorial views into orthographic views: (1 drawing sheet) 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.

Sectional views of mechanical components: (1 drawing sheet) 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.

Fasteners and other mechanical components: (Free hand sketch) Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints. Riveted joints, rivets and riveting, type of rivets, types of riveted joints etc. Bearing: Ball, roller, needle, foot step bearing. Coupling: Protected type, flange, and pin type flexible coupling. Other components: Welded joints, belts and pulleys, pipes and pipe joints, valves etc.

Overview of Computer Graphics: (2 drawing sheets) Covering theory of CAD software such as: The menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (Where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of Lines, Planes, Simple and compound Solids.

II Semester
Common to all branches of UG Engineering & Technology

2FY2-01: Engineering Mathematics-II

SN	CONTENTS
1	**Matrices:** Rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.
2	**First order ordinary differential equations:** Linear and Bernoulli's equations, Exact equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.
3	**Ordinary differential equations of higher orders:** Linear Differential Equations of Higher order with constant coefficients, Simultaneous Linear Differential Equations, Second order linear differential equations with variable coefficients: Homogenous and Exact forms, one part of CF is known, Change of dependent and independent variables, method of variation of parameters, Cauchy-Euler equation; Power series solutions including Legendre differential equation and Bessel differential equations.
4	**Partial Differential Equations – First order:** Order and Degree, Formation; Linear Partial differential equations of First order, Lagrange's Form, Non Linear Partial Differential equations of first order, Charpit's method, Standard forms.
5	**Partial Differential Equations– Higher order:** Classification of Second order partial differential equations, Separation of variables method to simple problems in Cartesian coordinates including two dimensional Laplace, one dimensional Heat and one dimensional Wave equations.

Semester – III & IV

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Computer Science & Engineering (AI)
2nd Year - III Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	3CAI2-01	Advanced Engineering Mathematics	3	0	0	3	30	70	**100**	**3**
2	HSMC	3CAI1-02/ 3CAI1-03	Technical Communication/ Managerial Economics and Financial Accounting	2	0	0	2	30	70	**100**	**2**
3	ESC	3CAI3-04	Digital Electronics	3	0	0	3	30	70	**100**	**3**
4	PCC	3CAI4-05	Data Structures and Algorithms	3	0	0	3	30	70	**100**	**3**
5		3CAI4-06	Object Oriented Programming	3	0	0	3	30	70	**100**	**3**
6		3CAI4-07	Software Engineering	3	0	0	3	30	70	**100**	**3**
			Sub Total	**17**	**0**	**0**					**17**
PRACTICAL & SESSIONAL											
7	PCC	3CAI4-21	Data Structures and Algorithms Lab	0	0	3		60	40	**100**	**1.5**
8		3CAI4-22	Object Oriented Programming Lab	0	0	3		60	40	**100**	**1.5**
9		3CAI4-23	Software Engineering Lab	0	0	3		60	40	**100**	**1.5**
10		3CAI4-24	Digital Electronics Lab	0	0	3		60	40	**100**	**1.5**
11	PSIT	3CAI7-30	Industrial Training	0	0	1		60	40	**100**	**1**
12	SODECA	3CAI8-00	Social Outreach, Discipline & Extra Curricular Activities							**100**	**0.5**
			Sub- Total	**0**	**0**	**13**					**7.5**
			TOTAL OF III SEMESTER	**17**	**0**	**13**					**24.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Teaching & Examination Scheme
B.Tech. : Computer Science & Engineering (AI)
2nd Year - IV Semester

SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
THEORY											
1	BSC	4CAI2-01	Discrete Mathematics Structure	3	0	0	3	30	70	**100**	**3**
2	HSMC	4CAI1-03/ 4CAI1-02	Managerial Economics and Financial Accounting /Technical Communication	2	0	0	2	30	70	**100**	**2**
3	ESC	4CAI3-04	Microprocessor & Interfaces	3	0	0	3	30	70	**100**	**3**
4	PCC	4CAI4-05	Database Management System	3	0	0	3	30	70	**100**	**3**
5		4CAI4-06	Theory of Computation	3	0	0	3	30	70	**100**	**3**
6		4CAI4-07	Data Communication and Computer Networks	3	0	0	3	30	70	**100**	**3**
			Sub Total	**17**	**0**	**0**					**17**
PRACTICAL & SESSIONAL											
7	PCC	4CAI4-21	Microprocessor & Interfaces Lab	0	0	2		60	40	**100**	**1**
8		4CAI4-22	Database Management System Lab	0	0	3		60	40	**100**	**1.5**
9		4CAI4-23	Network Programming Lab	0	0	3		60	40	**100**	**1.5**
10		4CAI4-24	Linux Shell Programming Lab	0	0	2		60	40	**100**	**1**
11		4CAI4-25	Java Lab	0	0	2		60	40	**100**	**1**
12	SODECA	4CAI8-00	Social Outreach, Discipline & Extra Curricular Activities							**100**	**0.5**
			Sub- Total	**0**	**0**	**12**					**6.5**
			TOTAL OF IV SEMEESTER	**17**	**0**	**12**					**23.5**

L: *Lecture,* ***T:*** *Tutorial,* ***P:*** *Practical,* ***Cr:*** *Credits*

ETE: *End Term Exam,* ***IA:*** *Internal Assessment*

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CAI2-01: Advanced Engineering Mathematics

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

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

SN	CONTENTS	Hours
1	**Random Variables:** Discrete and Continuous random variables, Joint distribution, Probability distribution function, conditional distribution.Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis.	7
2	**Binomial distribution**, Normal Distribution, Poisson Distribution and their relations, Uniform Distribution, Exponential Distribution. Correlation: Karl Pearson's coefficient, Rank correlation. Curve fitting. Line of Regression.	5
3	**Historical development**, Engineering Applications of Optimization, Formulation of Design Problems as a Mathematical Programming Problems, Classification of Optimization Problems	8
4	**Classical Optimization using Differential Calculus:** Single Variable and Multivariable Optimization with & without Constraints, Langrangian theory, Kuhn Tucker conditions	6
5	**Linear Programming:** Simplex method, Two Phase Method and Duality in Linear Programming. Application of Linear Programming: Transportation and Assignment Problems.	14
	TOTAL	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-III Semester: B.Tech. Computer Science and Engineering (AI)

3CAI1-02/4CAI1-02: Technical Communication

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

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	4
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
3	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
4	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	**26**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-III Semester: B.Tech. Computer Science and Engineering (AI)

3CAI1-03/ 4CAI1-03: Managerial Economics and Financial Accounting

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

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	4
2	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
3	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
4	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	**26**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CAI3-04: Digital Electronics

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

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

SN	CONTENTS	Hours
1	**Fundamental concepts:** Number systems and codes, Basic logic Gates and Boolean algebra: Sign & magnitude representation, Fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra.Theorems of Boolean algebra.	8
2	**Minimization Techniques and Logic Gates**: Principle of Duality - Boolean expression -Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions – Quine - McCluskey method of minimization.	8
3	**Digital Logic Gate Characteristics:** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies.MOS& CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET.	8
4	**Combinational Circuits:** Combinational logic circuit design, adder, subtractor, BCD adder encoder, decoder, BCD to 7-segment decoder, multiplexer demultiplexer.	8
5	**Sequential Circuits:** Latches, Flip-flops - SR, JK, D, T, and Master-Slave Characteristic table and equation,counters and their design, Synchronous counters – Synchronous Up/Down counters – Programmable counters – State table and state transition diagram ,sequential circuits design methodology. Registers –shift registers.	8
	TOTAL	**40**

Office of Dean Academic Affairs
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3CAI4-05: Data Structures and Algorithms

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

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

SN	CONTENTS	Hours
1	Stacks: Basic Stack Operations, Representation of a Stack using Static Array and Dynamic Array, Multiple stack implementation using single array, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions and Towers of Hanoi.	8
2	Queues: Basic Queue Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues- Round Robin Algorithm. Circular Queues, DeQueue Priority Queues. Linked Lists:Introduction, single linked list, representation of a linked list in memory, Different Operations on a Single linked list, Reversing a single linked list, Advantages and disadvantages of single linked list, circular linked list, double linked list and Header linked list.	10
3	Searching Techniques: Sequential and binary search.Sorting Techniques: Basic concepts, Sorting by: bubble sort, Insertion sort, selection sort, quick sort, heap sort, merge sort, radix sort and counting sorting algorithms.	7
4	Trees: Definition of tree, Properties of tree, Binary Tree, Representation of Binary trees using arrays and linked lists, Operations on a Binary Tree, Binary Tree Traversals (recursive), Binary search tree, B-tree , B+ tree, AVL tree, Threaded binary tree.	7
5	Graphs: Basic concepts, Different representations of Graphs, Graph Traversals (BFS & DFS), Minimum Spanning Tree(Prims &Kruskal), Dijkstra's shortest path algorithms.Hashing: Hash function, Address calculation techniques, Common hashing functions, Collision resolution: Linear and Quadratic probing, Double hashing.	8
	TOTAL	**40**

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

3CAI4-06: Object Oriented Programming

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

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

SN	CONTENTS	Hours
1	Introduction to different programming paradigm, characteristics of OOP, Class, Object, data member, member function, structures in C++, different access specifiers, defining member function inside and outside class, array of objects.	8
2	Concept of reference, dynamic memory allocation using new and delete operators, inline functions, function overloading, function with default arguments, constructors and destructors, friend function and classes, using this pointer.	8
3	Inheritance, types of inheritance, multiple inheritance, virtual base class, function overriding, abstract class and pure virtual function	9
4	Constant data member and member function, static data member and member function, polymorphism, operator overloading, dynamic binding and virtual function	9
5	Exception handling, Template, Stream class, File handling.	6
	TOTAL	40

3CAI4-07: Software Engineering

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

SN	CONTENTS	Hours
1	Introduction, software life-cycle models, software requirements specification, formal requirements specification, verification and validation.	8
2	Software Project Management: Objectives, Resources and their estimation, LOC and FP estimation, effort estimation, COCOMO estimation model, risk analysis, software project scheduling.	8
3	Requirement Analysis: Requirement analysis tasks, Analysis principles. Software prototyping and specification data dictionary, Finite State Machine (FSM) models. Structured Analysis: Data and control flow diagrams, control and process specification behavioral modeling	8
4	Software Design: Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation.	8
5	Object Oriented Analysis: Object oriented Analysis Modeling, Data modeling. Object Oriented Design: OOD concepts, Class and object relationships, object modularization, Introduction to Unified Modeling Language	8
	TOTAL	**40**

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3CAI4-21: Data Structures and Algorithms Lab

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

0L+0T+3P

SN	CONTENTS
1	Write a simple C program on a 32 bit compiler to understand the concept of array storage, size of a word. The program shall be written illustrating the concept of row major and column major storage. Find the address of element and verify it with the theoretical value. Program may be written for arrays up to 4-dimensions.
2	Simulate a stack, queue, circular queue and dequeue using a one dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.
3	Represent a 2-variable polynomial using array. Use this representation to implement addition of polynomials
4	Represent a sparse matrix using array. Implement addition and transposition operations using the representation.
5	Implement singly, doubly and circularly connected linked lists illustrating operations like addition at different locations, deletion from specified locations and traversal.
6	Repeat exercises 2, 3 & 4 with linked structure.
7	Implementation of binary tree with operations like addition, deletion, traversal.
8	Depth first and breadth first traversal of graphs represented using adjacency matrix and list.
9	Implementation of binary search in arrays and on linked Binary Search Tree.
10	Implementation of different sorting algorithm like insertion, quick, heap, bubble and many more sorting algorithms.

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Rajasthan Technical University, Kota

3CAI4-22 : Object Oriented Programming Lab

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

0L+0T+3P

SN	CONTENTS
1	Understand the basics of C++ library, variables, data input-output.
2	C++ program using with the concept of structures.
3	Implement class and object concepts and function overloading.
4	Write programs to understand dynamic memory allocation and array of objects.
5	Program to understand different types of constructors and destructor.
6	Implement friend function to access private data of a class and usage of this pointer.
7	Write programs to understand the usage of constant data member and member function, static data member and member function in a class.
8	Implement different types of inheritance, function overriding and virtual function
9	Implement Operator overloading concepts.
10	Write programs to understand function template and class template.
11	Write programs to understand exception handling techniques.
12	Write programs to understand file handling techniques.

3CAI4-23: Software Engineering Lab

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

0L+0T+3P

SN	CONTENTS
1	Development of requirements specification, function oriented design using SA/SD, object-oriented design using UML, test case design, implementation using Java and testing. Use of appropriate CASE tools and other tools such as configuration management tools, program analysis tools in the software life cycle.
2	Develop Software Requirements Specification (SRS) for a given problem in IEEE template.
3	Develop DFD model (level-0, level-1 DFD and Data dictionary) of the project.
4	Develop structured design for the DFD model developed.
5	Developed all Structure UML diagram of the given project.
6	Develop Behavior UML diagram of the given project.
7	Manage file, using ProjectLibre project management software tool.

3CAI4-24: Digital Electronics Lab

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

0L+0T+3P

SN	CONTENTS
1	To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify truth table of Ex-OR, Ex-NOR (For 2, 3, & 4 inputs using gateswith 2, 3, & 4 inputs).
2	To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized usingNAND& NOR gates.
3	To realize an SOP and POS expression.
4	To realize Half adder/ Subtractor& Full Adder/ Subtractor using NAND & NOR gatesand to verify their truth tables.
5	To realize a 4-bit ripple adder/ Subtractor using basic Half adder/ Subtractor& basic Full Adder/ Subtractor.
6	To verify the truth table of 4-to-1 multiplexer and 1-to-4 demultiplexer. Realize the multiplexer using basic gates only. Also to construct and 8-to-1 multiplexer and 1-to-8 demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demultiplexer.
7	Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -312 seven-segment display.
8	Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.
9	Construct a divide by 2,4& 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.
10	Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer. Note: As far as possible, the experiments shall be performed on bread board. However, experiment Nos. 1-4 are to be performed on bread board only.

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

4CAI2-01: Discrete Mathematics Structure

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

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

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Set Theory:** Definition of sets, countable and uncountable sets, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles) Venn Diagrams, proofs of some general identities on sets. **Relation:** Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem. **Function:** Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction. Composition of Functions. The Pigeonhole and Generalized Pigeonhole Principles.	7
3	**Propositional Logic:** Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. 2 way predicate logic. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers.	8
4	**Posets, Hasse Diagram and Lattices:** Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. **Combinatorics:** Introduction, Permutation and combination, Binomial Theorem, Multimodal Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions.	8
5	**Algebraic Structures:** Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.	8
6	**Graph Theory:** Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs, matching, vertex/edge covering.	8
	Total	40

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

II Year-IV Semester: B.Tech. Computer Science and Engineering (AI)

4CAI1-03/3CAI1-03: Managerial Economics and Financial Accounting

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

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	26

Office of Dean Academic Affairs
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4CAI1-02/3CAI1-02: Technical Communication

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

2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	3
3	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
4	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
5	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	26

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

4CAI3-04: Microprocessor & Interfaces

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

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

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introduction to Microprocessors, microcontroller; 8085 Microprocessor Architecture, pin description, Bus concept and organization; concept of multiplexing and de-multiplexing of buses; concept of static and dynamic RAM, type of ROM, memory map.	7
3	Software architecture registers and signals, Classification of instruction, Instruction set, addressing modes, Assembly Language Programming and Debugging, Programming Technique, instruction Format and timing.	8
4	Advance Assembly Language Programming, Counter and time delay; types of Interrupt and their uses, RST instructions and their uses, 8259 programmable interrupt controller; Macros, subroutine; Stack-implementation and uses with examples; Memory interfacing.	8
5	8085 Microprocessor interfacing:, 8255 Programmable Peripheral Interface, 8254 programmable interval timer, interfacing of Input/output device, 8279 Key board/Display interface.	8
6	Microprocessor Application: Interfacing scanned multiplexed display and liquid crystal display, Interfacing and Matrix Keyboard, MPU Design; USART 8251, RS232C and RS422A, Parallel interface-Centronics and IEEE 488.	8
	Total	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

4CAI4-05: Database Management System

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

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

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to database systems:** Overview and History of DBMS. File System v/s DBMS.Advantage of DBMS Describing and Storing Data in a DBMS.Queries in DBMS.Structure of a DBMS. **Entity Relationship model:** Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, and Design with ER Model- Entity v/s Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation v/s ternary Relationship Conceptual Design for a Large Enterprise.	7
3	**Relationship Algebra and Calculus:** Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Algebra and Calculus. **SQL queries programming and Triggers:** The Forms of a Basic SQL Query, Union, and Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.	8
4	**Schema refinement and Normal forms:** Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.	8
5	**Transaction Processing:** Introduction-Transaction State, Transaction properties, Concurrent Executions. Need of Serializability, Conflict vs. View Serializability, Testing for Serializability, Recoverable Schedules, Cascadeless Schedules.	8
6	**Concurrency Control: Implementation of Concurrency:** Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Deadlock handling, **Database Failure and Recovery:** Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.	8
	Total	40

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4CAI4-06: Theory Of Computation

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

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

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Finite Automata & Regular Expression: Basic machine, Finite state machine, Transition graph, Transition matrix, Deterministic and non-deterministic finite automation, Equivalence of DFA and NDFA, Decision properties, minimization of finite automata, Mealy & Moore machines. Alphabet, words, Operations, Regular sets, relationship and conversion between Finite automata and regular expression and vice versa, designing regular expressions, closure properties of regular sets, Pumping lemma and regular sets, Myhill- Nerode theorem , Application of pumping lemma, Power of the languages.	7
3	Context Free Grammars (CFG), Derivations and Languages, Relationship between derivation and derivation trees, leftmost and rightmost derivation, sentential forms, parsing and ambiguity, simplification of CFG, normal forms, Greibach and Chomsky Normal form , Problems related to CNF and GNF including membership problem.	8
4	Nondeterministic PDA, Definitions, PDA and CFL, CFG for PDA, Deterministic PDA, and Deterministic PDA and Deterministic CFL , The pumping lemma for CFL's, Closure Properties and Decision properties for CFL, Deciding properties of CFL.	8
5	Turing Machines: Introduction, Definition of Turing Machine, TM as language Acceptors and Transducers, Computable Languages and functions, Universal TM & Other modification, multiple tracks Turing Machine. Hierarchy of Formal languages: Recursive & recursively enumerable languages, Properties of RL and REL, Introduction of Context sensitive grammars and languages, The Chomsky Hierarchy.	8
6	Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, Un-decidability, examples of these problems like vertex cover problem, Hamiltonian path problem, traveling sales man problem.	8
	Total	40

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4CAI4-07: Data Communication and Computer Networks

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

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

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introductory Concepts: Network hardware, Network software, topologies, Protocols and standards, OSI model, TCP model, TCP/IP model, Physical Layer: Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System	7
3	Data Link Layer: Error Detection and Correction, Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction, Protocols: Stop and wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding window, Piggy backing, Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA	9
4	Network Layer: Design issues, Routing algorithms: IPV4, IPV6, Address mapping: ARQ, RARQ, Congestion control, Unicast, Multicast, Broadcast routing protocols, Quality of Service, Internetworking	8
5	Transport Layer: Transport service, Elements of transport protocols, User Datagram Protocol, Transmission Control Protocol, Quality of service, Leaky Bucket and Token Bucket algorithm	8
6	Application Layer**:** WWW, DNS, Multimedia, Electronic mail, FTP, HTTP, SMTP, Introduction to network security	7
	Total	40

4CAI4-21: Microprocessor & Interfaces Lab

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

0L+0T+2P

List of Experiments:

1. Add the contents of memory locations XX00 &XX01 & place the result in memory location XX02.
2. Add the 16 bit numbers stored in memory location & store the result in another memory location.
3. Transfer a block of data from memory location XX00 to another memory location XX00 in forward & reverse order.
4. Write a program to swap two blocks of data stored in memory.
5. Write a program to find the square of a number.
6. Write a main program and a conversion subroutine to convert Binary to its equivalent BCD.
7. Write a program to find largest & smallest number from a given array.
8. Write a program to Sort an array in ascending & descending order.
9. Write a program to multiply two 8 bit numbers whose result is 16 bit.
10. Write a program of division of two 8 bit numbers.
11. Generate square wave from SOD pin of 8085 & observe on CRO.
12. Write a program to perform traffic light control operation.
13. Write a program to control the speed of a motor.

4CAI4-22: Database Management System Lab

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

0L+0T+3P

List of Experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER,UPDATE and DELETE.
4. Write the queries to implement the joins.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG () and COUNT ().
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Perform the following operation for demonstrating the insertion , updation and deletion
10. Using the referential integrity constraints.
11. Write the query for creating the users and their role.

Data Base Designing Project:

For better understanding students (group of 3-4 students) should design data base for any data base project, understand the requirement and design methodology of project by its own.

Some example of data base design project like:

College management system, Inventory management system and Hospital management system.

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4CAI4-23: Network Programming Lab

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

0L+0T+3P

List of Experiments:

1. Study of Different Type of LAN& Network Equipments.
2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to implement various types of framing methods.
6. Write two programs in C: hello_client and hello_server
    a. The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection
    b. The client connects to the server, sends the string “Hello, world!”, then closes the connection
7. Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.
8. Repeat Exercises 6 & 7 for UDP.
9. Repeat Exercise 7 with multiplexed I/O operations.
10. Simulate Bellman-Ford Routing algorithm in NS2.

4CAI4-24: Linux Shell Programming Lab

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

0L+0T+2P

List of Experiments:

1. Use of Basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.
2. Commands related to inode, I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script based on control structure- **If-then-fi, if-then-else-if, nested if-else, to find:**
   - 3.1 Greatest among three numbers.
   - 3.2 To find a year is leap year or not.
   - 3.3 To input angles of a triangle and find out whether it is valid triangle or not.
   - 3.4 To check whether a character is alphabet, digit or special character.
   - 3.5 To calculate profit or loss.
4. Shell Programming - Looping- while, until, for loops
   - 4.1 Write a shell script to print all even and odd number from 1 to 10.
   - 4.2 Write a shell script to print table of a given number
   - 4.3 Write a shell script to calculate factorial of a given number.
   - 4.4 Write a shell script to print sum of all even numbers from 1 to 10.
   - 4.5 Write a shell script to print sum of digit of any number.
5. Shell Programming - case structure, use of break
   - 5.1 Write a shell script to make a basic calculator which performs addition, subtraction, Multiplication, division
   - 5.2 Write a shell script to print days of a week.
   - 5.3 Write a shell script to print starting 4 months having 31 days.
6. Shell Programming - Functions
   - 6.1 Write a shell script to find a number is Armstrong or not.
   - 6.2 Write a shell script to find a number is palindrome or not.
   - 6.3 Write a shell script to print Fibonacci series.
   - 6.4 Write a shell script to find prime number.
   - 6.5 Write a shell script to convert binary to decimal and decimal to binary
7. Write a shell script to print different shapes- Diamond, triangle, square, rectangle, hollow square etc.
8. Shell Programming – Arrays
   - 8.1 Write a C program to read and print elements of array.
   - 8.2 Write a C program to find sum of all array elements.
   - 8.3 Write a C program to find reverse of an array.
   - 8.4 Write a C program to search an element in an array.
   - 8.5 Write a C program to sort array elements in ascending or descending order.

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4CAI4-25: Java Lab

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

0L+0T+2P

List of Experiment:

1. Develop an in depth understanding of programming in Java: data types, variables, operators, operator precedence, Decision and control statements, arrays, switch statement, Iteration Statements, Jump Statements, Using break, Using continue, return.
2. Write Object Oriented programs in Java: Objects, Classes constructors, returning and passing objects as parameter, Inheritance, Access Control, Using super, final with inheritance Overloading and overriding methods, Abstract classes, Extended classes.
3. Develop understanding to developing packages & Interfaces in Java: Package, concept of CLASSPATH, access modifiers, importing package, Defining and implementing interfaces.
4. Develop understanding to developing Strings and exception handling: String constructors, special string operations, character extraction, searching and comparing strings, string Buffer class. Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements. Usage of throw, throws and finally.
5. Develop applications involving file handling: I/O streams, File I/O.
6. Develop applications involving concurrency: Processes and Threads, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Joins, and Synchronization.

Indicative List of exercises:

7. Programs to demonstrate basic concepts e.g. operators, classes, constructors, control & iteration statements, recursion etc. such as complex arithmetic, matrix arithmetic, tower of Hanoi problem etc.
8. Development of programs/projects to demonstrate concepts like inheritance, exception handling, packages, interfaces etc. such as application for electricity department, library management, ticket reservation system, payroll system etc.
9. Development of a project to demonstrate various file handling concepts.
10. Develop applications involving Applet: Applet Fundamentals, using paint method and drawing polygons. It is expected that each laboratory assignments to given to the students with an aim to In order to achieve the above objectives.