Subject: Weightage w.r.t marks Chapter wise.

Trade	Subject Name	Topics	Hours/Sheets	Marks
Medical Electronics	Biomedical Instrumentation	1.Cardiovascuar system and related equipment	12	20
		2. Introduction to Renal equipment	08	10
		3. Introduction to Central Nervous System equipment	10	15
		4. Introduction to Hearing and Speech	06	10
		5. Introduction to Ophthalmologist Equipment	06	10
		6. Reproductive System	08	15
		7. Dental Care	08	10
		8. Alimentary System	06	10
	Installation, Maintenance and Servicing of Medical Equipment	1.Medical Equipment	06	20
		2. Installation of Medical Equipment	06	20
		3. Stabilizers, Inverters and power supplies	08	20
		4. Safety Aspects	06	20
		5. Servicing of Medical Equipment	06	20
	Radiology and Imaging	1. Machine used or Medical Diagnosis	20	40
		2. Ultrasound Scanners	14	20
		3. C.T. Scanner	07	20
		4.MRI(Magnetic Resonance Imaging)	07	20
	Modern Communication and Telemetry	1. Introduction	14	25
		2. Multiplexing	10	15
		3. Typical ECG telemetry system	12	15
		4. Obstetrical telemetry system	06	10

		5. Implant able telemetry system	10	15
		6. Optical Fibre Communication	12	20
	Hospital Management and Clinical Practices	1. The Approach to planning	08	15
		2. Components and functions	12	30
		3. Trends in Hospital care and Economics	06	15
		4. Infection Control	12	20
		5. Maintainability of Engineering Services	10	20
Architecture	Architectural Drawing-I	1. Introduction to Studio Environment		05
		2. Line Work	05	15
		3. Lettering	04	15
		4. Introduction to Scale	01	15
		5.Geometric Shapes	02	25
		6. Orthographic Projections	02	25
	Free Hand Sketching	1. Free Hand line exercise of different types of lines	01	10
		2. Free hand sketching of two dimensional geometric figures	02	10
		3. Free hand sketching of three dimensional geometric objects	02	10
		4. Free hand sketching offsets of figures and objects	02	10
		5. Free hand sketching of human figures, trees furniture and vehicles etc.	02	10
		6. Free hand sketching of small building with shade and shadow sheets	02	10
		7. Free hand sketching of building with trees, human figures, sky, clouds and birds and other land scape element, using various mediums like pencil. ink & color		20
		8. Free hand sketches of		20

		various scenes such as railway- station, parking, parking places, bus stand etc.		
	History of Architecture-I	1.Pre Historical Architecture & introduction to history of architecture	06	10
		2. Western Civilization	08	20
		3. Greek Civilization	08	20
		4. Roman Civilization	08	20
		5. Indian Civilization	10	10
		6. Buddhist Architecture in India	08	20
	Building Materials	1. Building Stones	04	10
		2. Bricks	06	10
		3. Lime	04	05
		4. Cement	04	10
		5. Aggregates	02	05
		6. Mortar	04	05
		7. Concrete	06	15
		8. Timber	06	10
		9. Plastics	04	10
		10. Alloy & Metals	04	10
		11. Glass	04	10
	Architectural Drawing-II	1. Reviewing of Orthographic Projections	01	15
		2. Section of Solids	04	20
		3. Development of Surface	01	15
		4. Isometric view	03	25
		5. Axonometric views	05	25
	Theory of Design	1. Primary elements of design	02	10
		2. Design elements	10	20
		3. Principal of Design	20	30
		4. Relationship of Form & functions	03	10
		5. Relationship of Aesthetics & Utility	03	10
		6. Colors	10	20
	Building Construction –I	1. Brick Work	01	10
		2. Brick work in foundation	01	10
		3. Stone Work	01	10
		4. DPC	01	10
		5. Brick work in super	01	10

		structure		
		6. Opening in walls	02	10
		7. Classification of Arches & Lintels	02	10
		8. Joinery	01	10
		9. Flooring	01	10
	Building Materials –II	1. Floor Finishes	04	10
		2. Wall Finishes	06	12
		3. Ceiling Materials	06	12
		4. Building Hardware	04	16
		5. Application of Glass	04	06
		6. Roofing Material	06	16
		7. Additives & Admixtures	04	08
		8. Adhesives	02	05
		9. Kitchen & Toilet Fixtures	06	05
		10. Paints	06	10
	Architectural Design –I	1. Proportion of component of human body	01	10
		2. Human Activity	02	20
		3. Furniture standards	02	30
		4. Vehicles	01	10
		5. Street Furniture	03	20
		6. Graphic representation of plant materials	02	10
	Climatology	1. Earth & Global Climate	04	20
		2. Relationship of climate & comfort	06	20
		3. Sun Protection devices	16	20
		4. Wind Control	08	15
		5. Use of Building material wrt Climate	04	10
		6. Environment & Ecology	10	15
	Architectural Drawing-III	1. Perspective		15
		2. Simple Peptive		50
		3. Introduction to sciography- in plans, Elevation		20
		4. Introduction to Rendering		15
	Building Construction-II	1. Foundation of RCC Columns, R.C.C Walls, Retaining Walls & Their water proofing & cavity walls	01	20
		2. Superstructure		10

		3. R.C.C Frame construction with columns, beams, parapets, slabs	01	10
		4. Form work and shuttering for R.C.C work.	01	20
		5. Prefabricated R.C.C & concrete (plain) elements: Lintels, Partially cast R.C.C Beams, Concrete tiles, Beams and Channels etc	01	10
		6. Interior Finishes		15
		7. Exterior Finishes	01	15
	Architectural Design-II	1. Study of spaces & layout of furniture for various activities in small structure comprising public utilizes like fuel station, Milk Bar, Florist Kiosk and Guard House		20
		2. Drawing to be produced: Site plan, Plans, Elevation, Sections Views		60
		3. Time Problems: Furniture layout & through a given mono functional space such as a café, nursery, classroom etc.		20
	History of Architecture – II	1. Temple Architecture in India		30
		2. Early Christian Architecture	04	10
		3. Byzantine Architecture	04	10
		4. Romanesque Architecture	04	10
		5. Gothic Architecture	04	10
		6. Renaissance Architecture	08	20
		7. Baroque Architecture	04	10
	Surveying	1. Introduction	04	08
		2. Chain Surveying	06	12
		3. Campus Surveying	06	20
		4. Leveling	06	20
		5. Plain table Surveying	08	20
		6. Contouring	02	05
		7. Minor Instruments	02	05
		8. Exercise of Modern Surveying Equipment	02	05
		9. Introduction to GIS	02	05
	Architectural	1. Design Project including		100

	Design – III	site plan detailed floor plans showing furniture layout, section, elevation, free hand 3-D view, perspectives		
	Building Construction – III	1. Timber doors & windows	05	30
		2. Timber Flooring	01	15
		3. Timber trusses & Slates roofing	01	15
		4. Timber Stair case	01	10
		5. Stair Cases of various configuration in RCC	01	15
		6. Ramp construction detail	01	15
	Building Services	1. Water supply		15
		2. Drainage		20
		3. Thermal & sound insulation		10
		4. Lighting & electrical fittings		15
		5. Heat Ventilation & air conditioning		10
		6. Vertical transportation systems		10
		7. Fire fighting services		10
		8. Integration of lighting, air conditioning etc.		10
	Working Drawing-I	1. Preparation of working drawings for a simple single storeyed residential building		40
		2. Terrace Plan		15
		3. Section		15
		4.Elevation		10
		5.Details of toilet & kitchen		10
	Structural Mechanics	1. Force system & equilibrium	10	20
		2. Simple Stress & Strain	10	10
		3. Centroid & moment of Inertia	14	25
		4. Sheer force & Bending Moment	20	25
		5. Bending stress in Beams	10	20
	History of Architecture –III	1. Islamic Architecture in India	15	30
		2. Industrial Revolution	06	20
		3. Modern Architecture in	15	25

		Europe & America		
		4. Contemporary/post independence Architecture in India	12	25
	Computer Application in Architecture-I	1. Introduction to 2-D CAD	08	10
		2. Creating and Saving a new Drawing	04	10
		3. Drawing Commands	16	30
		4. Viewing an Existing Drawing	08	10
		5. Modifying an existing Drawing	16	30
		6.Making & inserting Blocks	12	10
	Architectural Design-IV	1. Small Housing complex/Crafts Museum, Exhibition centers/ small service station for cars/ tourist resorts		100
	Building Construction-IV	1. Roofing		50
		2. Metal glazing for doors & windows		30
		3. Iron Mongery		20
	Building Bye-Laws & Municipal Drawings	1. Need of building bye laws for urban development	04	05
		2. Basic Terminology	06	15
		3. Factor involving planning of bye-laws	06	20
		4. Bye-Laws	12	20
		5. Zonning	06	20
		6. Case study of existing residential & commercial building w.r.t implementation of local byelaws.	06	05
		7. Study of various performs to be used	04	10
		8. BIS & CPWD By-laws/ Standards for removing Architectural barriers for person with disabilities	04	05
	Working	1. Preparation of working	05	40

	Drawing-II	Drawings such as Site Plan/ Foundation layout plan & sectional details/ Ground Floor Plan/ Upper Floor Plans/ Terrace Plan with rain water drainage & disposal details		
		2. Built –in furniture		20
		3. Entrance gate, boundary wall & railing details		20
		4. Electrical Layout plan of an already handled design project		10
		5. Water, supply, sewage & drainage layout plan & fire fighting layout of an already dealt design project		10
	Structure System & Design	1. Structure System	10	10
		2. RCC Structure	30	50
		3. Steel Structure	14	40
	Computer Application in Architecture-II	1. Dimensioning	08	30
		2. Adding Text	06	20
		3. Plotting Drawings	08	20
		4. Minor Projects	12	10
		5. Major Projects	30	20
	Computer Application in Architecture-III	1. Fundamental of 3-D Drafting	20	30
		2. Making an existing 2-D Plan Drawing compatible to 3-D Drafting	16	10
		3. 3-D Modeling	30	30
		4. Adobe Photoshop & Coral Draw	10	10
		5. Presentation Software Like PowerPoint	20	20
	Architectural Professional Practice	1. Tender & Quotations	04	10
		2. Contract	04	10
		3. Architect & his work	02	05
		4. Code, Competition fees	02	05
		5. Architect Act, 1972	04	10
		6. Human Relations	06	15

		7. Communication	06	15
		8. Conflicts	04	10
		9. CPM & PERT	08	10
		10. Entrepreneurship	08	10
	Landscape Design	1. Elements of Landscapes		25
		2. Principles of Landscapes of Design w.r.t Architectural Function		25
		3. Relationship of landscape & climate		25
		4. Outdoor Functional Spaces w.r.t different building types		25
	Housing	1. Housing as a human need, social, cultural, & Economic factors affecting the housing needs	04	10
		2. Type of Housing detached, semi detached, Patio Type, row houses, apartments	06	15
		3. Layouts of Housing row type, curvilinear, cluster, cul-de-sacs, high rise	08	10
		4. Housing standards with reference to building codes	04	15
		5. Housing for Economically weaker section etc.		20
		6. Cost Effective building technology & material in housing	04	10
		7. Housing Policy & finance	06	10
		8. Study o housing in a neighborhood unit with reference to circulation pattern etc.	08	10
	Town Planning	1. Overview of Town Planning	14	15
		2. Growth of Industrial Town	06	10
		3. Planning Process	04	10
		4. Road & Street System	04	15
		5. Introduction to Urban Land uses & Their mgmt.	14	40
		6. Legislation & Urban	06	10

		Control		
	Site Management	1. Introduction to Site Planning & mgmt.		10
		2. Construction Planning	06	10
		3. Network Technique	12	20
		4. Site Organization	06	10
		5. Inspection & quality control	08	15
		6. Safety in construction	18	30
		7. Construction Labour	02	05
	Interior Design	1. Space Analysis	04	20
		2. Case Study of Live Projects	06	20
		3. Materials	04	10
		4. Details: Furniture/ Storage/Partition/False ceiling/ Panelling	12	20
		5. Electrical Layout in Interior	06	10
		6. Interior Design Problem of restaurants etc.	16	20
	Building Maintenance	1. Principles of building maintenance & its economic construction	06	20
		2. Identifying the sources f problems in Interiors & Exteriors	06	15
		3. Causes of dampness & remedies for removing dampness	06	15
		4. Defects & repair in roofs	10	10
		5. Common defects & their repair in buildings	06	15
		6. Surface finishes defects & repairs	06	15
		7. Maintenance of water supply & drainage System	08	10
Auto Mobile Engineering	Basic Automobile Engineering	1. Introduction	06	14
		2. Thermodynamics	04	10
		3. Concept of static Pressure	04	08
		4. Flow of Liquid	06	10
		5. Flow Through Pipes & Hydraulic Pumps	06	10
		6. Power Plant	06	12
		7. Automotive System	06	14

		8. Suspension	04	10
		9. Auto Industry in India	06	12
	Basic Mechanical Engineering	1. Stress & Strain	08	16
		2. Beams & Bending	06	12
		3. Bending & Shear Stresses	07	12
		4. Springs	05	12
		5. Shafts	06	14
		6. Simple Mechanism	04	08
		7. Flywheel & Governor	06	12
		8. Balancing	03	06
		9. Vibrations	03	08
	Manufacturing Technology	1. Fitting	10	20
		2. Metallic & Non Metallic Coatings	06	10
		3. Foundry	10	20
		4. Lathes	10	20
		5. Shaper	02	10
		6. Inspection Instruments & gauges	10	20
	Auto Engineering Drawing-I	1. Joints & Pulleys/ Engine bearing/Engine components/Screw jack/Spark Plug	10	30
		2. Gears	02	35
		3. Cam Profile	03	35
	Auto Engine-I	1. Introduction	10	16
		2. Construction Detail	08	16
		3. Fuel Supply System	06	10
		4. Carburation	08	20
		5. Ignition System	04	10
		6. Cooling System	04	10
		7. Lubrication System	04	10
		8. Air Supply/ Intake/ Exhaust System	04	08
	Chassis, Body & Transmission-I	1. Chassis on Body	06	14
		2. Clutch	05	14
		3. Transmission	06	14
		4. Drive Line	08	16
		5. Steering	08	14
		6. Brakeing System	08	16
		7. Wheels & Tyres	07	12
	Manufacturing	1. Drilling & Boring	08	14

	Technology-II			
		2. Machining Process	12	18
		3. Finishes Operations	04	10
		4. Gear Production	04	10
		5. CNC Machines	04	10
		6. Bending & Forming	04	10
		7. Welding	10	18
		8. Types of Coolants & Lubricants	02	10
	Auto Engineering Drawing-II	1. Engine Components	24	30
		2. Chassis Components	33	30
		3. Auto Electrical Circuits/transmission/garage	39	40
	Auto Engine-II	1. High Speed Diesel Engine	10	20
		2. Combustion	08	16
		3. Different Type OF Engine	08	20
		4. Performance of Engine	06	10
		5. Engine Pollutants & its Control	10	22
		6. Modern Vehicle	06	12
	Chassis, Body & Transmission – II	1. Clutch	08	18
		2. Transmission	10	20
		3. Steering	08	18
		4. Suspension System	12	20
		5. Power Breaks	06	16
		6. Auto Motives Safety System	04	08
	Garage Equipment	1. General Tools	06	10
		2. General Equipment	12	18
		3. Tuning & Testing Equipment	10	14
		4. Engine Repair Tools/ measuring & Testing Equipments	12	18
		5. Electrical Repair Equipment	06	10
		6. Chassis, Body of reconditioning/ testing equipment	06	12
		7. Engine of reconditioning/	12	18

		testing equipment		
	Auto Electrical & Electronics Equipments	1. Introduction	06	06
		2. LED Acid & other Batteries	12	22
		3. Charging System	08	14
		4. Starting System	08	12
		5. Ignition System	08	12
		6. Lighting System	08	14
		7. Electrical Accessories	14	20
	Tractors & Earth Moving Machineries	1. Tractor	12	20
		2. Hydraulic System	08	14
		3. Tractor Chassis	08	12
		4. Supplementary System	06	10
		5. Tractor Wheels & Tyres	10	12
		6. Earth Moving Machinery	12	22
		7. Repair & Maintenance	08	10
	Motor Vehicle Act & Transport Management	1. Motor Vehicle Act	12	20
		2. Inspection & Fitness of Vehicle	06	10
		3. Insurance of Vehicle	06	10
		4. Driving	08	12
		5. Road Safety	08	12
		6. Pollution Control	08	10
		7. Transport Management	16	26
Electronics	Basic Electrical Engg.	DC Circuits	05	16
		DC Circuit Theorems	04	12
		Constant Voltage & Constant Current Sources	03	12
		Electro Magnetic Induction	08	12
		Batteries	04	12
		AC Fundamentals	12	12
		AC Circuits	10	18
		Various Types of power plants	02	08
	Analog Electronics-I	Semi Conductor physics	12	20
		Semiconductor Diode	12	20
		Int. to Bipolar Transistor	12	20
		Transistor Biasing Circuits	06	10

		Single Stage transistor amplifier	10	12
		Field effect Transistors	12	18
	Analog Elex. –II	Multistage Amplifiers	08	12
		Large Signal Amplifier	08	12
		Feedback in Amplifiers	08	12
		Sinusoidal Oscillators	08	16
		Wave Shaping Circuits	04	10
		Multivibration Circuits	08	12
		Operational Amplifiers	06	16
		Regulated DC Power Supplies	06	10
	Electronic Components and Materials	Materials	32	40
		Components	32	60
	Principles of Communication	Introduction	03	08
		Amplitude Modulation	08	14
		Frequency Modulation	07	16
		Principles of AM Modulator	04	08
		Principles of FM Modulator	06	14
		Demodulation of FM Wave	07	16
		Phase Modulation	03	06
		Pulse Analog modulation	05	10
		Concept of Spread spectrum , frequency hopping & direct sequence spread spectrum , CDMA & generation of spreading sequences Advantages of CDMA	05	08
	Digital Electronics-I	Introduction	01	02
		Number System	10	12
		Logic Gates	04	10
		Logic Simplification	08	14
		Arithmetic Circuits	03	06
		Multiplexer/ Demultiplexer	04	06
		Decoders/ Display Devices & Associated Circuits	04	08
		Encoders & Comparators	04	08
		Laches & Fillip Flops	08	12
		Counters	10	12
		Shift Registers	08	10
	Electrical Machines	Three Phase supply	03	10

		Transformer	05	12
		Dc Motor	08	20
		3 Phase Induction Motors	08	16
		Synchronous Motors	06	14
		Single Phase motors	06	14
		Steeper Motor & Servo Motor	06	14
	Electronic Instruments & measurement	Basics of measurement	04	10
		Multimeter	08	14
		Electronic Volt Meter	06	10
		Ac Milli Volt Meter	04	08
		Cathode Ray, Oscilloscope	05	14
		Single Generator & Analysis Instruments	06	14
		Impedance Bridges & Q Meters	12	18
		Digital Instruments	08	12
	Network Filters & Transmission Lines	Networks	12	20
		Network Theorem	08	24
		Filters	16	26
		Transmission Lines	26	30
	Communication Engineering-I	Am/ Fm Transmitters	08	14
		AM/FM Radio Receivers	16	26
		Antennas	16	30
		Propagation	16	30
	Computer Programming & Application	Information Storage & Retrieval		24
		Programming in C		60
		Computer Application Overview		12
		Typical Application		04
	Digital Electronics-II	Logic Families	08	18
		A/D & D/A Converters	08	16
		Memories	12	18
		Combinational Circuits	08	18
		Sequential circuits	08	18
		Arithmetic & Logic Unit	04	12
	Microprocessors & Applications	Introduction	04	06

		Architecture of Microprocessors 8085	16	24
		Introduction Set For Intel 8085	16	24
		Interfacing & Data Transfer Schemes	08	20
		Peripheral Devices	12	20
		Introduction to Other 8-bit Microprocessor	08	06
	Consumer Electronics	Audio System	09	10
		Television	12	24
		Colour TV	12	26
		Cable Television	03	14
		VCR, DVD, VCD	06	16
		Video Camera		10
	Maintenance of Computer System	CRT Display Device	06	16
		Printers	06	16
		Keyboard & Mouse	06	16
		Buses & Ports	06	10
		Secondary Memory	08	16
		Mother Board	06	10
		Network Device	05	16
	Communication Engineering-II	Introduction to Microwaves	03	08
		Micro Wave Devices	09	18
		Wave Guide	04	10
		Microwave Components	04	18
		Micro Wave Antennas	03	08
		Micro Wave Communication System	03	10
		Radar System	06	18
		Satellite Communication System	06	10
	Optical Fibre System	Introduction	08	16
		Optical Fibre & Cables	08	18
		Losses in Optical Fibre System	08	16
		Light sources & Detectors	08	18
		Connectors, Splicing & Coupling	06	16
		Optical Fibre System	08	16
	Advanced Microprocessors	8086 Microprocessors	08	18

		System Design using 8086	06	12
		Programming of 8086	10	22
		8086 Interrupt System	04	12
		Micro controller	08	14
		Application of Microprocessor	08	16
		Introduction to 32-bit Microprocessor	04	06
	Power Electronics	Introduction to Thyristors & Other Power Electronics Devices	12	24
		Control Rectifiers	06	20
		Inverters, Choppers, Dual Converters & Cyclo Converters	12	22
		Tyristorised Control of Electric drives	08	26
		Uninterrupted Power Supplies	04	08
	Medical Electronics	Anatomy And Physiology	06	12
		Overview of Medical Electronics Equipments	04	16
		Electrodes	08	16
		Transducers	08	16
		Biomedical Recorders	12	12
		Patient Monitoring System	12	20
		Safety Aspects of Medical Instruments	06	08
	Instrumentation	Measurement	04	08
		Transducer	08	10
		Measurement of Displacement & Strain	08	16
		Force & Torque Measurement	10	10
		Pressure Measurement	08	06
		Flow Measurement	06	08
		Measurement of Temperature	08	16
		Measurement of other Non Electrical Quantities	06	14
		Elements of Telemetry & Data acquisition system		12
	Digital & Data Communication	Introduction	04	12
		Digital Communication	12	20
		Data Communication	12	16

		Hardware		
		Network & Control Considerations	16	20
		Mobile communication	10	20
		Fascimile(Fax)	06	12
	Micro Controllers and PLCs	Microcontrllers series (MCS)	08	24
		Instruction Set, Addressing Modes, Instruction Types	08	12
		Assembly Language Programming	08	06
		Design an Interface	08	10
		Introduction to PLCs	06	14
		Instruction Set	04	12
		Ladder Diagram Programming	04	06
		Application of PLCs in Industry with case study from electronics industry	04	06
	Computer Architecture & Organisation	Basic computer organization & Design	10	20
		Central Processing Unit	10	20
		Computer Arithmetic	08	10
		Register transfer & micro Operation	04	10
		Input Output Organisation	12	20
		Memory Organization	12	20
	Entrepreneurship Development and Management	Entrepreneurship	04	06
		Entrepreneurial Support System	06	12
		Market Survey & Opportunity identification(Business Planning)	06	12
		Project Report Preparation	06	10
		Managerial Aspects of Small Business	08	10
		Legal Aspect of Small Business	06	10
		Environmental Consideration	06	10
		Miscellaneous	06	10
		Motivation	04	10

		Leadership	02	10
Applied Chemistry-I		Language of Chemistry		20
		Chemical Bonding		20
		Water		25
		Solutions		15
		Electrolysis		20
Applied Chemistry-II		Metallurgy		20
		Fuel		20
		Corrosion		15
		Lubricants		15
		Cement & Glass		15
		Classification & Nomenclature of organ compounds		15
Mechanical Engineering	Engineering Drawing-I	Drawing Office Practice		05
		Different Types of Lines & Freehand Sketching	01	10
		Lettering Technique & practice	02	10
		Dimensioning	01	10
		Scale	03	10
		Principals of Projection	08	20
		Sectional Views	02	10
		Isomeric Views	02	20
		Introduction to third angle Projection	01	05
	Applied Mechanics	Introduction	06	02
		Laws of Forces	06	18
		Moment	06	15
		Friction	06	15
		Center of Gravity	06	15
		Application of Laws of Motion	10	15
		Simple Machines	08	20
	Engineering Drawing-II	Detail & Assembly Drawing/ Threads/ Locking Devices		20
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		Process control at loom shed	24	36
	Garment Manufacturing Technology	Cutting	10	24
		Sewing Properties of Seams	10	20
		Use of components and Trimming	10	18
		Pressing	10	18
		Quality Control	8	20
	EDM	Entrepreneurship	4	8
		Entrepreneurship Support System	6	12
		Market Survey and Opportunity Identification	6	13
		Project report Preparation	6	14
		Managerial Aspects of Small Business	8	15
		Legal Aspect of Small Business	6	12
		Environmental	6	12

		Considerations		
		Misc.	6	14
Fashion Design/Fashion Technology	Comm. Skills-I	Facets of Literature		30
		Grammar & Usage		20
		Translation		15
		Paragraph Writing		15
		Comprehension		20
	Textile Science	Int.		30
		New Fibres & their prop		20
		Relevance of thread counter		10
		Yarn Processing		10
		Fabric Structure		30
	Elements of Design	Understanding Design		10
		Relationship to Design		10
		Elements of Design		20
		Colour		30
		Elements of Design		10
		Design Variation		20
	BPM & Style Interpretation	Int. to measurement		20
		Developing Pattern		10
		Pattern making tools		20
		Style Interpretation		40
		Pattern making terms		10
	Fashion Illustrations-I	1 –3		20
		4-7		20
		8-10		10
		11-14		10
		15-17		20
		18 &19		10
		20 &21		10
	Garment Construction	Tools & equipment/Defects & remedies/ St. line, Square		40
		Classification of seams		10
		Variation of pleats gathers		10
		Darts/Gathers		10
		Types of fasteners		10
		Edge finishing of goods		20
	Comm. Skill-II	Facets of Literature		30
		Art of précis writing		15
		Grammer & usage		15
		Correspondence		10

		Drafting		10
		Glossary of technical & scientific terms		10
		Communication		10
	Textile sc.-II	Fabric structure/finishers		20
		Role of models / colour Finishers		20
		Printing / Colour fastness		20
		Shrinkage Calculation		10
		Fabric Defects		30
	Principles of Design	POD, Rhythm , Harmony		50
		Space		20
		Collage		30
	BPM & Style Interpretation	Principles of PM		30
		Pattern details		10
		Pattern styles		10
		Parts		10
		Basic fig. Types		20
		Layouts		20
	Fashion illustrations-II	1-5		20
		6&7		10
		8		10
		9-12		40
		13-17		20
	Garment cont.-II	Types of Plackets		20
		Necklines		20
		Pockets		20
		Sleeves		20
		Fastners		20
	Garment design-1	Designing of any 5 gmt.		40
		Casual & Formal Frock, jumpsuits		30
		Designing Accessories		15
		Sourcing Materials		15
	Pattern Making & Style Interpretation	Drafting of adults bodice block & sleeve		30
		Drafting of adults skirt block		15
		Adaptation of Plain Sleeve		20
		Collars		15
		Lady’s Saree Blouse		20

	Drapping	Introduction		40
		Basic Pattern by Drapping		60
	Garment Construction –III	Tools & Equipment/Selection of Fabrics/Preperation of Fabrics/Sequence of Cutting/Handling of Special Fabrics		40
		Construction details		20
		Decorative details		20
		Fitting		20
	Traditional Indian Textiles	Traditional Embroideries		50
		Traditional Woven Textiles		10
		Traditional printed textiles		10
		Traditional Painted Textiles		10
		Traditional Knotted Textiles		10
	History of costumes	Orign of clothing		10
		Ancient Indian Civilization		30
		Medieval period		10
		Traditional costumes		10
		Fashion theories		10
		Egyptian costumes/greek costumes/ roman period/Byzantine Period		30
	Basics of Information Technology	Theory		30
		MS-Excel		30
		MS-Word		20
		Internet		20
	Garment Design-II	Designing Indian Wear		25
		Designing Western Wear		40
		Designing sports wear		25
		Preparing Scrap Book		10
	Pattern Making, Grading	Dart Manipulation Methods		20
		Dart Manipulation dart Series		20
		Addition of fullness		20
		Developing pattern		20
		Grading		20
	Garment construction	Construction of party frock		10
		Const. Of jump suit		10

		Const. Of Boys shorts		20
		Const. Of boys shirt		40
		Const. Of shirt & top		20
	History of Fashion	Victorian period		20
		French revolution		15
		20^{th} century fashion		30
		Fashion terminology		15
		Fashion theories, fashion cycle		20
	CAD in Fashion Design-I	Corel Draw, Photoshop/Geometrical shape/ motif/ female flesh figure		50
		Executive wear/ drape a saree/ nursery print/ redesign a texture/ design a mood story/ design a logo		30 20
	Craft documentation	Evolution of craft		50
		Material characteristics		20
		Relating craft to contemporary situation		30
	Pattern making	Lady's shirt		20
		Drafting kurta, churidar		10
		Pattern of lady's skirt/pattern of lady's top/ pattern of lady's nightwear		20
		Lady's Trousers		20
		Drafting of men's shirt		30
	Garment const.-V	Salwar kameez		20
		Kurta pyjami		10
		Saree Blouse		10
		Lehnga Choli		20
		Gent's shirt		40
	CAD in Fashion Design-II	Create prints, texture etc.		40
		CAD package for PM/Grading		60
	Apparel management & Quality Control	Basic prodn terms		20
		Prod. Planning control		20
		Material handling		10
		What is Quality		10
		Inspection		10

		ISO-9001		10
		Defects classification		20
	Minor project work	Design collection of 5 outfits		60
		Presentation		40
	Industrial Training	Understanding working of export house		40
		Report making		20
		Preparing 2 garments		40
	Pattern making	Drafting making		30+10
		Commercial pattern alongwith layout		10+10+20+20
	Fashion retailing & apparel merchandising	Concept of retailing/int. to terms/concept of wholesale merchants & agents		20
		Sales promotion policies/ concept of visual merchandising/ retail organization		20
		Apparel industry profile/ Fashion Merchandising/Sourcing		60
	Portfolio	Design collection		60
		Create 2 designs		40
	Major project work	Making design collection		50
		Industrial training		50

Topic No. in Syllabus	Contents	Credits Hours	Marks Allocated
1.2 APPLIED MATHEMATICS – I			
1.	1. Algebra (20 hrs) 1.1 Permutations and Combinations, Value of ${}_nP_r$ and ${}_nC_r$, its properties and simple problems 1.2 Binomial theorem (without proof) for positive integral index (expansion and general term); Binomial theorem for any index (expansion only) first and second binomial approximation with application to engineering problems 1.3 Partial fractions (linear factors, repeated linear factors, non reducible quadratic factors) 1.4 Determinants and Matrices – expansio n of determinants (upto third order) using sarrus rule, expansion method and pivotal's condensation method. Properties of determinants, solution of equations (upto 3 unknowns) by Cramer's rule. Definition of matrix, addition, subtraction and multiplication of matrices (upto third order). Inverse of a matrix by adjoint method and elementary row transformations. Solution of equations (up to 3 unknowns) by Matrix method 1.5 Logarithm: general properties of logarithms, calculations of engineering problems using lo g tables	20	40
2.	2. Trigonometry (11 hrs) 2.1 Addition and subtraction formulae, product formulae and their application in engineering problems. Transformation from product to sum or difference of two angles or vice versa, multiple and submultiple angles 2.2 Conditional identities, solution of triangles (excluding ambiguous cases).	11	30

	2.3 Graphs of sin x, cos x, and tan x, e^x		
3.	3. Vectors (11 hrs) Definition of vector and scalar quantities. Addition and substraction of vectors. Dot product and cross product of two vectors. Thumb rule. Angle between two vectors, application of dot and cross product in engineering problems, scalar triple product and vector triple product	11	8
4.	4. Complex Numbers (9 hrs) Definition, Real and Imaginary parts of a complex number, Polar and Cartesian representation of a complex number and conversion from one form to the other, conjugate of a complex number, modulus and argument of a complex number, addition, subtraction, multiplication and division of a complex number.	9	12
5.	5. Statistics and Probability (13 hrs) Evaluation of standard deviation and process capabilities. Rank, Rank correlation, probability: definition and laws on probability, concept of random variable, probability distribution (Binomial, Poisson and Normal) and their applications. Drawing control charts for average ($\bar{x}$) and range (R)	13	10
1.3 APPLIED PHYSICS – I			
1.	1. Units and Dimensions (6 hrs) 1.1 Physical quantities 1.2 Fundamental and derived units 1.3 Systems of units (FPS, CGS, MKS and SI units) 1.4 Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain) 1.5 Principle of homogeneity 1.6 Dimensional equations and their applications, conversion from one	6	

	unit to another unit for density, force, pressure, work, power, energy, velocity, acceleration 1.7 Limitations of dimensional analysis		
2.	2. Force and Motion (8 hrs) 2.1 Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors 2.2 Force, resolution and composition of forces – resultant, parallelogram law of forces 2.3 Equilibrium of forces, Lami's theorem 2.4 Newton's Laws of motion – concept of momentum, Newton's laws of motion and their applications, determination of force equation from Newton's second law of motion; Newton's third law of motion conversion of momentum, impulse and impulsive forces, simple numerical problems based on third law. 2.5 Projectile, horizontal and oblique projections and equation of trajectory 2.6 Derivation of time of flight, maximum height and horizontal range 2.7 Circular motion 2.8 Relation between linear and angular velocity and linear acceleration and angular acceleration 2.9 Centripetal force (derivation) and centrifugal force 2.10 Banking of roads	8	
3.	3. Work, Power and Energy (8 hrs) 3.1 Work: definitions and its SI units 3.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) 3.3 Power: definitions and its SI units, calculation of power in simple cases 3.4 Energy: Definitions and its SI units: Types: Kinetic energy and Potential energy, with examples and their derivation 3.5 Principle of conservation of mechanical	8	

	energy (for freely falling bodies), transformation of energy from one form to another		
4.	4. Properties of Matter (8 hrs) 4.1 Elasticity, definition of stress and strain 4.2 Different types of modulus of elasticity 4.3 Explanation of stress – strain diagram 4.4 Pressure – its units, gauge pressure, absolute pressure, atmospheric pressure, Bourdon's pressure, manometers and barometer gauges 4.5 Surface tension – its units, measurement of surface tension by capillary tube method, applications of sur face tension, effect of temperature and impurity on surface tension 4.6 Fluid motion, stream line and turbulent flow, Reynolds number 4.7 Viscosity and coefficient of viscosity; derivation of terminal velocity; effect of temperature on viscosity	8	
5.	5. Waves and vibrations (8 hrs) 5.1 Generation of waves by vibrating particles 5.2 Wave motion with examples 5.3 Types of wave motion, transverse and longitudinal wave motion with examples 5.4 Velocity, frequency and wave length of a wave (relationship $v = \eta\lambda$) 5.5 Sound and Light waves 5.6 Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. 5.7 Vibration of cantilever and beam, determination of time period of a cantilever 5.8 Free, forced and resonant vibrations with examples	8	
6.	6. Rotational Motion (5 hrs) 6.1 Definitions of torque, moment of inertia, radius of gyration 6.2 Derivation of rotational kinetic energy and angular momentum 6.3 Conservation of angular momentum	5	

	(qualitative) 6.4 Theorems of parallel and perpendicular axes		
7.	7. Gravitation and satellites (8 hrs) 7.1 Kepler's law of planetary motion 7.2 Newton's law of gravitation 7.3 Escape velocity (derivation) 7.4 Satellites, Geostationary satellite	8	
8.	8. Temperature and its measurement (5 hrs) 8.1 Principles of measurement of temperature and different scales of temperature 8.2 Difference between heat and temperature on the basis of K.E. of molecules 8.3 Bimetallic and Platinum resistance thermometer: their merits and demerits 8.4 Pyrometers – Disappearing filament optical pyrometer	5	
9.	9. Transfer of Heat (8 hrs) 9.1 Modes of transfer of heat (conduction, convection and radiation with examples) 9.2 Coefficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method) 9.3 Properties of heat radiation 9.4 Stefan's law, Kirchoff's law, Wien's law, Planck's black body radiation law 9.5 Prevost's theory of heat exchange	8	
1.4 APPLIED CHEMISTRY-I			
1.	1. Language of Chemistry (6 hrs) 1.1 Definition of symbol, formula, valency and chemical equation. 1.2 Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of a chemical compound 1.3 Essentials of a chemical equation, balancing of a chemical equation by Hit and Trial method	6	

2.	2. Chemical Bonding (4 hrs) 2.1 Electronic concept of valency 2.2 Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency with the help of suitable examples to each	4	
3.	3. Water (10 hrs) 3.1 Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) in boilers for steam generation. 3.2 Methods to remove hardness of water (i) Clark's Process (ii) Permutit Process (iii) Soda Lime process (iv) Ion-Exchange process. Simple numerical problems related to soda lime process. 3.3 Definition of degree of hardness of water and the systems to express the degree of hardness of water. Simple numerical problems related to finding the degree of hardness on different scales. 3.4 Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply	10	
4.	4. Solutions (6 hrs) 4.1 Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples 4.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molality as applied in relation to a solution. 4.3 Simple numerical problems related to volumetric analysis 4.4 Definition of pH, and different industrial applications of pH	6	
5.	5. Electrolysis (6 hrs) 5.1 Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples 5.2 Faraday's Laws of Electrolysis	6	

	5.3 Simple numerical problems based upon the laws of electrolysis 5.4 Different industrial applications of 'Electrolysis' 5.5 Elementary account of (i) lead acid battery and (ii) Ni-Cd battery with special reference to their reaction mechanisms.		
1.6 ENGINEERING DRAWING – I			
1.	1. Drawing Office Practice 1.1 Drawing instruments 1.2 Sizes and layout of standard drawing sheets 1.3 Sizes of drawing boards 1.4 Drafting table/board		5
2.	2. Different types of Lines and Free Hand Sketching (1 sheet) 2.1 Different types of lines in engineering drawing as per BIS specifications 2.2 Practice in free hand sketching of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, small and large circles, parabolas, curves and ellipses		5
3.	3. Lettering Techniques and Practice (2 sheets) 3.1 Instrumental single stroke (capital and inclined) lettering of 35 mm height in the ratios of 7:4 3.2 Instrumental double stroke lettering of 35 mm height in the ratio of 7:4, vertical 3.3 Free hand lettering (alphabet and numerals) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5, 3, 5, 7, 10, and 15 mm heights in the ratio of 7:4		10
4.	4. Dimensioning (1 sheet) 4.1 Necessity of dimensioning, terms and notations – methods and principles, dimensioning small components as in 4.2 below (mainly theoretical instructions) 4.2 Dimensioning of overall sizes, circles, thread holes, chamfered		5

	surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches – chain and parallel dimensioning		
5.	5. Scale (3 sheets) 5.1 Scales – their need and importance, Definition of representative fraction (RF); Find RF of a given scale 5.2 Types of scales 5.3 Construction of plain and diagonal scales		15
6.	6. Principle of Projections (strictly in first angle projection) (8 sheets) 6.1 Principle of orthographic projection 6.2 Projection of points situated in different quadrants 6.3 Projection of lines, Lines inclined to one plane and parallel to the other and vice versa 6.4 Projection of Planes: Planes perpendicular and parallel to either of the planes; planes perpendicular to one plane and parallel to the other or vice versa 6.5 Projection of solids, such as Prism, Cube, Cylinder and Cones with axis perpendicular to horizontal plane or parallel to horizontal plane/vertical plane or both 6.6 Drawing 3 orthographic views of given objects (at least five objects) 6.7 Drawing 6 views of given objects (non-symmetrical one or two objects may be selected for this exercise) 6.8 Identification of surfaces on drawn orthographic views from isometric object drawn 6.9 Exercises on missing lines, surfaces and views 6.10 Sketching practice of pictorial views from isometric objects		35
7.	7. Sectional Views (2 sheets) Need for sectional views – cutting planes methods of representing sections,		10

	conventional sections of various material, classification of sections, conventions in sectioning Drawing of full section, half section, partial broken out sections, off-set sections, revolved sections and removed sections. Exercises on sectional views of different isometric views Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections		
8.	8. Isometric Views (2 sheets) 8.1 Fundamentals of isometric projections (theoretical instructions) 8.2 Isometric views from 2 or 3 given orthographic views		10
9.	9. Introduction to Third angle projection (1 sheet) **Note: Minimum 15 drawing sheets will be prepared by the students**		5
2.2 APPLIED MATHEMATICS – II			
1.	1. Co-ordinate Geometry (18 hrs) 1.1 Area of a triangle, centroid and incentre of a triangle (given the vertices of a triangle), Simple problems on locus 1.2 Equation of straight line in various standard forms (without proof) with their transformation from one form to another, Angle between two lines and perpendicular distance formula (without proof) 1.3 Circle: General equation and its characteristics given: ➢ The center and radius ➢ Three points on it ➢ The co-ordinates of the end's of the diameter 1.4 Conics (parabola, ellipse and hyperbola), standard equation of conics (without proof), given the equation of conic to calculate foci, directrix, eccentricity, latus rectum, vertices and axis related to different conics Differential Calculus	18	30
2.	2. Differential Calculus (22 hrs)	22	30

	2.1 Concept of function, four standard limits Lt $(x^n - a^n) / (x - a)$, Lt Sin x/x, Lt $(a^x - 1)/x$, Lt $(1+x)^{1/x}$ $x \to a$ $x \to 0$ $x \to 0$ $x \to 0$ 2.2 Concepts of differentiation and its physical interpretation ➢ Differentiation by first principle of x^n, $(ax + b)^n$, Sin x, cos x, tan x, sec x,, cosec x and cot x, e^x, a^x, log x. Differentiation of a function of a function and explicit and implicit functions ➢ Differentiation of sum, product and quotient of different functions ➢ Logarithmic differentiation. Successive differentiation excluding n^{th} order 2.3 Application of derivatives for (a) rate measure (b) errors (c) real root by Newton's method (d) equation of tangent and normal (c) finding the maxima and minima of a function (simple engineering problems)		
3.	3. Integral Calculus (16 hrs) 3.1 Integration as inverse operation of differentiation 3.2 Simple integration by substitution, by parts and by partial fractions 3.3 Evaluation of definite integrals (simple problems) by explaining the general properties of definite integrals 3.4 Applications of integration for ➢ Simple problem on evaluation of area under a curve where limits are prescribed ➢ Calculation of volume of a solid formed by revolution of an area about axis (simple problems) where limits are prescribed ➢ To calculate average and root mean square value of a function ➢ Area by Trapezoidal Rule and Simpson's Rule	16	30
4.	4. Differential Equations (8 hrs) Solution of first order and first degree differential equation by ➢ Variable separation	8	10

	➢ Homogeneous differential equation and reducible homogeneous differential equations ➢ Linear differential equations and reducible linear differential equations		
2.3 APPLIED PHYSICS – II			
1.	1. Applications of sound waves (6 hrs) 1.1 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time 1.2 Ultrasonics – production (magnetostriction and peizoelectric) and their engineering applications	6	
2.	2. Principle of optics (9 hrs) 2.1 Introduction: reflection of light, image formation in mirrors (convex and concave), refraction and refractive index, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection 2.2 Defects in image formation by lenses and their correction 2.3 Simple and compound microscope, astronomical and Galileo telescope, magnifying power and its calculation (in each case) 2.4 Overhead projector and slide projector	9	
3.	3. Electrostatics (9 hrs) 3.1 Coulombs law, unit charge 3.2 Gauss's Law 3.3 Electric field intensity and electric potential 3.4 Electric field of point charge, charged sphere (conducting and nonconducting), straight charged conductor, plane charged sheet 3.5 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors 3.6 Dielectric and its effect on capacitors, dielectric constant and dielectric break down	9	
4.	4. Electricity (6 hrs) 4.1 Ohm's law 4.2 Resistance of a conductor, specific resistance,	6	

	series and parallel combination of resistors, effect of temperature on resistance 4.3 Kirchoff's laws, wheatstone bridge principle and its applications 4.4 Heating effect of current and concept of electric power		
5.	5. Semi conductor physics (9 hrs) 5.1 Energy bands, intrinsic and extrinsic semi conductors, p-n junction diode and its characteristics 5.2 Diode as rectifier – half wave and full wave rectifier, semi conductor transistor pnp and npn (concept only)	9	
6.	6. Modern Physics (9 hrs) 6.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, helium – neon and ruby lasers and applications 6.2 Fibre optics: Introduction, optical fiber materials, types, light propagation and applications 6.3 Super conductivity: Phenomenon of super conductivity, effect of magnetic field, critical field, type I and type II super conductors and their applications) 6.4 Energy sources – conventional and non-conventional (wind, water, solar, bio, nuclear energy), only elementary idea	9	
2.4 APPLIED CHEMISTRY-II			
1.	1. Metallurgy (8 hrs) 1.1 A brief introduction of the terms: Metallurgy (types), mineral, ore, ga ngue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting calcination and refining as applied in relation to various metallurgical operations 1.2 Metallurgy of (i) Aluminium (ii) Iron with their physical and chemical properties 1.3 Definition of an alloy, purposes of alloying,	8	

	composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin, alnico and invar		
2.	2. Fuels (10 hrs) 2.1 Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples 2.2 Definition of Calorific value of a fuel and determination of calorific value of a liquid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values 2.3 Brief description of 'Proximate' and 'Ultimate' analysis of a fuel. Importance of conducting the proximate and ultimate analysis of a fuel 2.4 Qualities of a good fuel and merits of gaseous fuels over those of other varieties of fuels 2.5 Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas	10	
3.	3 Corrosion (3 hrs) 3.1 Meaning of the term 'corrosion' and its definition 3.2 Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory 3.3 Prevention of corrosion by 1. (a) Alloying (b) Providing metallic coatings 2. Cathodic protections: (a) Sacrificial (b) Impressed voltage method	3	
4.	4 Lubricants (4 hrs) 4.1 Definition of (i) lubricant (ii) lubrication 4.2 Classification of lubricants 4.3 Principles of lubrication (i) fluid film lubrication (ii) boundary lubrication (iii) extreme pressure lubrication 4.4 Characteristics of a lubricant such as viscosity, viscosity index, volatility oiliness, acidity, emulsification, flash point and	4	

	fire point and pour point.		
5.	5 Cement and Glass (2 hrs) 5.1 Manufacture of Portland Cement 5.2 Manufacture of ordinary glass and lead glass	2	
6.	6. Classification and Nomenclature of Organic Compounds (5 hrs) Classification of Organic Compounds, functional group, Homologus Series, Nomenclature, Physical and Che mical properties, and industrial use of Organic Compounds, IUPAC system of nomenclature of Carboxylic acid, Alcohols, Phenols, Aldehydes, Ketones and Amines.	5	
2.5 GENERAL ENGINEERING			
1.	**MECHANICAL ENGINEERING** **Theory** **1. Transmission of Power** (8 hrs) 1.1 Transmission of power through belt, rope drives and pulleys, gears and chains 1.2 Different type of pulleys and their application 1.3 Chain drives and its comparison with belt drive 1.4 Gear drives, types of gears, simple gear trains and velocity ratio	8	
2.	**2. Internal combustion Engines** (14 hrs) 2.1 Classification and application of IC Engines commonly used: spark ignition and compression ignition engines. 2.2 Working principles of two stroke and four stroke petrol and diesel engines 2.3 Ignition system in petrol engines i.e. spark ignition, magneto ignition 2.4 Spark plug 2.5 Carburetor 2.6 Cooling system of IC Engines: Lubrication of IC Engines 2.7 General maintenance of engines	14	
3.	**3. Air Conditioning System** (8 hrs) 3.1 Basic principle of refrigeration and air conditioning	8	

	3.2 Working of centralized air conditioner 3.3 Concept of split air conditioner and its applications		
4.	4. **Pumps:** Types and their uses (2 hrs)	2	
5.	**ELECTRICAL ENGINEERING** **Theory** 5. Application and Advantages of Electricity: (3 hrs) 5.1 Difference between AC and DC 5.2 Various applications of electricity 5.3 Advantages of electrical energy over other types of energy	3	
6.	6. Basic Quantities of Electricity: (4 hrs) 6.1 Definition of voltage, current, power and energy with their units 6.2 Name of the instruments used for measurement of quantities given in 5.1 6.3 Connection of the instruments in 5.2 in electric circuit	4	
7.	7. Various Types of Power Plants: (3 hrs) 7.1 Elementary block diagram of thermal, hydro and nuclear power stations 7.2 Brief explanation of the principle of power generation in above power stations	3	
8.	8. Elements of Transmission Line: (4 hrs) 8.1 Pictorial diagram of a three-phase transmission and distribution system showing transformers, supports, conductors, insulators and earth wire etc. 8.2 Brief function of accessories of transmission lines 8.3 Earthing of lines, substation and power station - need and practices adopted	4	
9.	9. Distribution System (4 hrs) 9.1 Distinction between high and low voltage distribution system 9.2 Identification of three phase wires, neutral wires and the earth wire on a low voltage distribution system	4	

	9.3 Identification of the voltage between phases and between one phase and neutral 9.4 Distinction between three phase and single phase supply		
10.	10. Supply from the Poles to the Distribution Board: (3 hrs) 10.1 Arrangement of supply system from pole to the distribution board 10.2 Function of service line, energy meter, main switch, distribution board	3	
11.	11. Domestic Installation: (4 hrs) 11.1 Distinction between light and fan circuits and single phase power circuit, sub circuits 11.2 Various accessories and parts of installation, identification of wiring systems 11.3 Common safety measures and earthing 11.4 Introduction to BIS code of safety and wiring installation	4	
12.	12. Electric Motors and Pumps: (5 hrs) 12.1 Definition and various application of single phase and three phase motors 12.2 Connection and starting of three phase motors by star delta starter 12.3 Conversion of horse power in watts or kilowatts 12.4 Type of pumps and their applications	5	
13.	**CIVIL ENGINEERING** **Theory** 13. Construction Materials (10 hrs) Basics of various construction materials such as stones, bricks, lime, cement and timber along with their properties, physical/ field testing and uses, elements of brick masonry.	10	
14.	14. Foundations (8 hrs) i) Bearing capacity of soil and its importance ii) Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines	8	

15.	15. Concrete (8 hrs) Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/ field testing of concrete, mixing of concrete	8	
16.	16. RCC (4 hrs) Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building	4	
2.6 BASIC MICROBIOLOGY			
1.	1. **Introduction** (16 hrs) Classification of living system: Whittaker's five Kingdom concept. Definition of Microbiology. Historical Developments in Microbiology. Classification of microorganisms (Unicellular, Multicellular, Prokaryotes, Eukaryotes). Cell and cell organelles (including ribosomes, mitochondria, endoplasmic reticulum, vacuoles, etc) – their functions	16	40
2.	2. **Pure Culture** (8 hrs) Streak plating, pour plating, spread plating, serial dilution technique, Isolation and preservation – lyophilization, slant method, liquid nitrogen method	8	15
3.	3. **Microbial Growth** (8 hrs) Growth curve and its different phases, Synchronous growth, factors affecting microbial growth, generation time-their significance	8	15
4.	4. **Bacteria** (8 hrs) Structure size and shape. Types depending upon different requirements. Gram positive and negative bacteria. Mode of reproduction.	8	15
5.	5. **Fungi** (8 hrs) Yeast and moulds –structure: their growth requirements, mode of reproduction, its importance.	8	15

3.1 FOOD MICROBIOLOGY			
1.	1. Introduction – Definition, historical developments in the food microbiology and its significance (5 hrs)	5	10
2.	2. Microbiology of milk and milk products like cheese, butter, Ice-cream, milk powder (6 hrs)	6	10
3.	3. Microbiology of meat, fish, poultry and egg products (6 hrs)	6	10
4.	4. Microbiology of fruits and vegetable products like jam, jelly, sauce, juice (6 hrs)	6	10
5.	5. Microbiology of cereal and cereal products like bread, (6 hrs)	6	10
6.	6. Microbial spoilage of foods – food borne pathogens, food poisoning, food infection and intoxication (14 hrs)	14	30
7.	7. Concept, determination and importance of TDT, F, Z and D value; factors affecting the heat resistance of micro-organisms (09 hrs)	9	10
8.	8. Anti- microbial agents – physical and chemical agents – their mechanism of action (6 hrs)	6	10
3.2 FOOD CHEMISTRY AND NUTRITION			
1.	1. Importance of food. Scope of food chemistry (1 hrs)	1	2
2.	2. Introduction to different food groups: their classification and importance (3 hrs)	3	3
3.	3. Water (5 hrs) Structure of water molecule, types and properties of water, water activity and its importance	5	10
4.	4. Carbohydrates (5 hrs) Definition, classification, sources, chemical make-up, properties, nutritional and	5	10

	industrial importance		
5.	5. Proteins (5 hrs) Sources, chemical make- up, properties, nutritional aspects– amino acids, amino essential acids, biological value, PER (Protein Efficiency Ratio), and industrial importance	5	10
6.	6. Fats (5 hrs) Sources, chemical make- up, properties, nutritional aspects – essential fatty acids, PUFA (Polyunsaturated Fatty Acids) hydrogenation, rancidity and industrial importance	5	10
7.	7. Minerals and Vitamins (5 hrs) Importance and sources of minerals and vitamins with special emphasis on calcium, iodine, zinc, iron, floride, fat, and minerals soluble and water-soluble vitamins, effect of processing and storage on vitamins	5	10
8.	8. Deficiency disorders and requirement of different nutrients (8 hrs)	8	20
9.	9. Food Pigments (3 hrs) Importance, types and sources of pigments - their changes during processing and storage	3	5
10.	10. Enzymes (8 hrs) Definition, importance, sources, nomenclature, classification – discuss their application in food processing in brief	8	20
3.3 PRINCIPLES OF FOOD PROCESSING AND PRESERVATION			
1.	1. Scope and trends in food industry (8 hrs) Status of Indian food industry with emphasis on State of Haryana. Definition of food – food technology, food science, food preservation and food engineering – basic considerations. Importance of food processing and preservation. Classification of foods on the basis of shelf life, pH, origin; Different types of	8	15

	food spoilage viz. microbiological, bio-chemical, chemical, physical and their effects on food quality		
2.	2. Preservation by sugar and salt (5 hrs) Principles of Salt and sugar preservation, Intermediate Moisture Food (IMF) like jam, jelly, marmalade; Different techniques of pickling	5	10
3.	3. Preservation by Low Temperature (6 hrs) Low temperature required for different foods – refrigeration – refrigeration load, refrigeration systems; slow and fast freezing, freezing process; types of freezer advantages and disadvantages of freezing; storage and thawing of frozen food	6	10
4.	4. Preservation by High Temperature (6 hrs) Pasteurization, Sterilization, Canning: their Definition, Method, advantages and disadvantages,	6	10
5.	5. Moisture Removal (10 hrs) Evaporation, concentration, drying and dehydration, types of dryers, advantages and disadvantages, selection of dryers,	10	20
6.	6. Preservation by Chemical Preservatives (4 hrs) Types of chemical preservatives used in different food products and their stability during processing	4	10
7.	7. Preservation of foods by Radiation – Irradiation of foods, dozes of irradiation – its effect on food quality (3 hrs)	3	10
8.	8. Advanced method of food preservation (4 hrs) Principles of: a) High pressure technology of food preservation b) Infra-Red (IR) technique c) Microwave heating	4	10
9.	9. Asepsis and removal of micro organism (2 hrs)	2	5
3.4 PRINCIPLES OF FOOD ENGINEERING			
1.	1. Introduction (8 hrs)	8	8

	Physical properties like colour, size, shape, density, specific gravity, thousand grain weight/bulk density, porosity, viscosity of food materials and their importance Thermal, conductivity, specific heat and thermal diffusivity.		
2.	2. Materials and energy Balance (7 hrs) Basic principles, total mass & component mass balance, system boundaries, material balance calculations, principle of energy balance, Heat, Enthalpy, calculations of specific neat.	7	12
3.	3. Fluid Mechanics (5 hrs) Manometers, fluid flow characteristics, Reynolds, number, pumps – principles, types, and working of most common pumps used in food industry	5	5
4.	4. Heat and Mass Transfer during food processing – Modes of heat transfer (5 hrs) i.e. conduction, convection and radiation. Principles of microwave heating, different heat exchangers. Principle of mass transfer, diffusion. Fick's law	5	12
5.	5. Thermal Processing of Foods (7 hrs) Specifications, selection, operation and periodical maintenance of equipment used in food industry viz pasteurizer, Auto clave, evaporators, heat exchangers, boilers, freezer	7	5
6.	6. Preliminary Unit operation (2 hrs) Clearing Aims & methods, sorting & Grading Aims & methods	2	7
7.	7. Conversion Unit Operations: Size Reduction (8 hrs) Theory of commination; Calculation of energy required during size reduction. Crushing efficiency; Size reduction equipment; Size reduction of fibrous, dry and liquid foods; effects of size reduction on sensory characteristics and nutritive	8	17

	value of food Mixing Mixing Agitating, kneading, blending, homogenization, mixing equipment, time calculation, mixing Index.		
8.	8. Separation Processes (18 hrs) d) Filtration Theoretical aspects; fundamental equation for filtration, constant rate filtratio n, constant pressure filtration, filtration equipment, ultra filtration and reverse osmosis e) Sedimentation Theory; Gravitational sedimentation of particles in liquids and gases, sedimentation equipment f) Separation Theory, basic crystallization, liquid – liquid separation, particle gas separation, centrifuge equipment like cream separator, garber centrifuge and clarifies used in diary industry g) Sieving Separation based on size; types of screens; effectiveness of screens, Fineness modulus of sample h) Distillation Theory, Raoult's Law, Relative volatility, Types of distillation	18	29
9.	9. Psychrometry (4 hrs) Principle of psychometry and its application	4	5
3.5 HANDLING, TRANSPORTATION AND STORAGE OF FOODS			
1.	1. Introduction (2 hrs) Scope and importance of handling, transportation and storage of food and food products, post harvest losses	2	6
2.	2. Post Harvest Changes in Foods – Physiological, chemical, microbiological and biochemical (3 hrs)	3	8
3.	3. Handling, Transportation and Storage (5 hrs) Various unit operations of post- harvest handling, transportation, study of different	5	18

	conveying systems like belt conveyors, chain conveyors, screw conveyors, hydraulic conveyors, pneumatic conveyors, vibrating and oscillating conveyors, bucket elevators – their selection, operation and maintenance.		
4.	4. Grains (5 hrs) Preparation of grains for storage, Storage requirements, infestation control, mycotoxin, handling practices, causes of spoilage and their prevention, factors affecting quality of grain during storage and types of storage structures and facilities	5	20
5.	5. Fruits and Vegetables (3 hrs) Handling and spoilage during transportation and storage – its prevention	3	8
6.	6. Animal Foods (5 hrs) Pre-slaughter handling and transportation system – their effects on quality of meat products, transportation and storage requirements, ante-mortem examination of animals	5	14
7.	7. Milk (02 hrs) Collection, pre-cooling, handling and transportation systems – their effects on quality of milk	2	6
8.	8. Eggs (2 hrs) Candling and grading, packaging, handling, pre-treatment, transportation and storage	2	8
9.	9. Cold Storage (5 hrs) Design parameters, selection of parameters for designing cold storage for food products, different types of refrigerants, refrigerator systems such as vapors compression refrigerators, vapors absorption refrigerators, air cycle refrigeration etc. Specific purposes, criteria for selection, operation and maintenance of refrigeration systems, Cooling load calculations	5	12

3.6 TECHNOLOGY OF CREEAL AND PULSES			
1.	1. Introduction (6 hrs) Status, production and major growing areas of cereals, pulses and oil seeds in India and world Structure and chemical composition of cereals, pulses and oil seeds, anitinutritional factors wherever applicable	6	12
2.	2. Cereals (20 hrs) 2.1 Wheat: types of wheat, conditioning and tempering, types of wheat milling technology, pasta and extruded products 2.2 Rice: Varieties of rice, classification of rice based on various physical parameters, parboiling, milling of rice, and factors affecting quality of rice products 2.3 Maize: Classification of maize, dry and wet milling of corn, preparation of corn flakes 2.4 Barley and sorghum: Grain characteristics, technology of malt production, milling, malting and popping of sorghum	20	42
3.	3. Millets (6 hrs) Different millets and their chemical composition, processing and utilization of millets	6	14
4.	4. Pulses (6 hrs) Pretreatment of pulses for milling, milling of major pulses	6	12
5.	5. Snacks foods based on cereals, pulses and oil seeds – their production technology (4 hrs)	4	8
6.	6. By-product utilization of different milling industries (6 hrs)	6	12
4.1 TECHNOLOGY OF MILK AND MILK PRODUCTS			
1.	1. Introduction – Status and scope of dairy industry in India (1 hrs)	1	2
2.	2. Fluid Milk (12 hrs)	12	24

	Definition of milk, composition, physical and chemical properties of milk constituents and nutritive value of milk, factors affecting composition of milk, types of milk, Physico-chemical properties of milk: Colour, flavour, taste, specific gravity, & density, boiling and freezing point, refractive index, acidity and pH, viscosity, surface tension, thermal conductivity. Basis for pricing of milk		
3.	3 Quality control tests (4 hrs) Platform tests like-smell, appearance, temp, sediment, acidity, lactometer reading Chemical/Laboratory test: Acidity, PH, alcohol, fat, SNF, etc. Microbiological: SPC, MBRT, Resazurin tests etc.	4	10
4.	4. Fluid Milk Processing (6 hrs) Receiving, Filtration and clarification, straining, standardization Homogenization and its effects, Pasteurization: and various systems of Pasteurization; LTLT, HTST, UHT methods, Pasteurizers (Heating system, cooling system, flow controller, regenerator, flow division valve) sterilization, packaging of fluid milk	6	12
5.	5. Coagulated Milk Products (6 hrs) Channa, paneer, classification and manufacturing process of cheese	6	12
6.	6. Butter/Ghee – Manufacture and storage of butter and ghee (4 hrs)	4	10
7.	7. Condensed Milk (4 hrs) Types and factors affecting the quality of condensed milk, storage of condensed milk	4	8
8.	8. Dry Milk Products (4 hrs) Methods of drying milk (Drum and Spray drying), factors affecting the quality of dry milk. Introduction to instant non-fat dry milk	4	8

	packaging of dry milk products		
9.	9. Frozen Products (3 hrs) Manufacturing of and ice cream; factors affecting the quality of frozen products	3	6
10.	10. Cleaning and sanitation of dairy plant and equipment (4 hrs)	4	8
4.2 FRUITS AND VEGETABLES TECHNOLOGY			
1.	1. Introduction (3 hrs) Status and scope of fruits and vegetables industry in India, classification, composition and nutritive value of fruits and vegetables, factor influencing composition and quality of fruits and vegetables	3	5
2.	2. Preparatory Operations and Related Equipments (5 hrs) Cleaning, sorting, grading, peeling and blanching methods and their equipments	5	5
3.	3. a) Ingredients and processes for the manufacture of: (8 hrs) i) jam, jellies, marmalade, preserves, (ii) pickles and chutneys b) Defects and factors affecting the quality of above	8	20
4.	4. Tomato Products (4 hrs) Ingredients and their role, process for the manufacture of tomato ketchup, sauce, puree and paste – factors affecting the quality and quality control measures	4	10
5.	5. Juices (4 hrs) Raw materials, extraction, classification, processing and aseptic packaging	4	10
6.	6. Thermal Processing of Fruits and Vegetables (9 hrs) History, definition, various techniques of thermal processing and their effects on the quality of fruits and vegetable products, thermal process time, introduction to concept of thermal process calculations, types of containers and their selection,	9	20

	spoilage of canned foods		
7.	7. a) Dehydration of fruits; equipment and process for dehydration of plums, apricot, apple, fig, grapes peach etc b) Dehydration of Vegetables: equipment and process for dehydration of peas, cauliflower, potato, methi, mushroom, tomato etc c) Osmo-dehydration – basic concept and applications (5 hrs)	5	10
8.	8. Freezing (4 hrs) Freezing process of selected fruits and vegetables: peas, beans, cauliflower, apricot, mushroom – changes during freezing and spoilage of frozen foods	4	10
9.	9. Food Laws and FPO standards for fruits and vegetable products (4 hrs)	4	5
10.	10. By-products utilization (4 hrs)	4	5
4.3 TECHNOLOGY OF MEAT, FISH AND POULTRY PRODUCTS			
1.	1. Introduction to Indian meat, fish and poultry industry (1 hrs)	1	2
2.	2. Structure of muscle, stratiated muscle and associated connective tissues, composition of muscle, post – mortem inspection, slaughter of meat animals, different cuts of lamb and their uses (8 hrs)	8	18
3.	3. Post-mortem changes – Loss of homeostasis, post-mortem glycolysis and pH decline. Rigor mortis (6 hrs)	6	15
4.	4. Preparatory operations of meat and meat products (8 hrs) Abattoir – Definition and construction; basic preparatory procedures (commintion, emulsification, pre-blending) Cured and smoked meats, sausage products – classification, processing steps, and canned meat, meat pickles	8	20
5.	5. Handling and Dressing of Poultry (4 hrs)	4	5

	Inspection of poultry birds, dressing and preparation of ready to cook poultry, factors affecting the quality		
6.	6. Egg and Egg Products (6 hrs) Structure, chemical composition and nutritive value, spoilage of eggs and preservation of whole egg and egg products, preparation of egg powder	6	15
7.	7. Fish and Fish Products (6 hrs) Types of fish, composition and nutritive value, judging the freshness of fish, fish grading and cooking of fish, smoking, pickling, salting and dehydration, preservation of fish and processed fish products	6	15
8.	8. Frozen Storage of fresh and processed meat, poultry and fish (4 hrs)	4	5
9.	9. By-products of meat, fish, poultry and egg industry (5 hrs)	5	5
4.4 FOOD FERMENTATION TECHNOLOGY			
1.	1. Introduction (3 hrs) Definition, advantages of fermentation and nutritive value of fermented food products	3	6
2.	2. Type of fermentation processes; different substrates for fermentation process; pure cultures and their maintenance procedures (6 hrs)	6	12
3.	3. Fermentor (6 hrs) Types of fermentor, different parts – agitation/imspellers, aerator, baffles, process control, functions and maintenance of various parts of fermenters	6	12
4.	4. Technology of Fermented Products (12 hrs) Production of distilled beverages, wine, beer, vinegar and sausages and brandy bakers yeast, bread	12	26
5.	5. Traditional Fermented Foods (12 hrs) Curd, yogurt, idli, dosa, dhokla, srikhand, tempeh	12	24

	and miso, sauerkraut, butter milk, lassi, sausage		
6.	6. Single Cell Protein (6 hrs) Sources, micro-organism, process, nutritive value and advantages and limitations	6	12
7.	7. Concept of production of vitamins and amino acids (3 hrs)	3	6
4.5 TECHNOLOGY OF NON-ALCOHOLIC BEVERAGES			
1.	1. Introduction (2 hrs) Definition, scope and status of beverage industry in India	2	5
2.	2. Ingredients of food beverages; sweeteners, emulsitifiers, coloring agents, flavoring agents, stablizers, water and their quality (6 hrs)	6	22
3.	3. Mineral Water and its specifications and standards (6 hrs)	6	20
4.	4. Carbonated Beverages (8 hrs) Equipment and machinery for carbonated beverages, water treatment, syrup preparation, containers and closures. Cleaning, carbonation, filling, inspection and quality control	8	25
5.	5. Non-carbonated beverages (6 hrs) Technology, specification, equipment and machinery for instant and normal tea and coffee, fruit juice based beverages, synthetic beverages	6	20
6.	6. Sanitation and hygiene in beverage industry (4 hrs)	4	8
4.6 BAKERY AND CONFECTIONERY TECHNOLOGY			
1.	1. Introduction – Status of Bakery industry in India (2 hrs)	2	5
2.	2. Raw Materials for Bakery Products (6 hrs) Flour, sugar, shortening, yeast, salt etc as raw material for bakery products, their role and PFA specifications of these raw materials	6	10

3.	3. Manufacturing of Bakery Products (26 hrs) Different types of bread and preparation of bread using different methods, quality evaluation of bread, staling of bread Different types of biscuits and preparation of biscuits using different methods, quality evaluation of biscuits Different types of cakes and pastries, preparation of cakes and pastries using different methods, quality evaluation of cakes, different types of toppings Preparation of other bakery products: rusks, crackers, buns, muffins and pizza Types of packaging materials used for above bakery products	26	55
4.	4. Confectionery Products (6 hrs) Introduction, classification of confectionery products, confectionery ingredients like starch, fats, colours, flavours. Brief account of sweeteners like Gur, refined sugar, beet sugar, white sugar and liquid sweeteners like Molasses, corn syrup, high fructose syrup, maple syrup. Reaction of sugar like caramelization, hydrolysis sand crystallization, sugar boiled, chocolate and Indian compectionary	6	15
5.	5. Layout out, setting up of units and hygienic conditions required in bakery plant, operation and maintenance of bakery equipment (8 hrs)	8	15
5.1 COMPUTER APPLICATIONS IN FOOD TECHNOLOGY			
1.	1. Introduction (8 hrs) Introduction to various software for their application in food technology	8	20
2.	2. Application of MS Excel to solve the problems of Food Technology (20 hrs) a) Chemical kinetics in food processing: - Determining rate constant of zero order reaction - First order rate constant and half life of reactions - Determining energy of activation of vitamin degradation during food	20	40

	storage - Rates of Enzymes catalyzed reaction b) Microbial distraction in thermal processing of food - Determining decimal reduction time from microbial survival data - Thermal resistance factor, Z- values in thermal processing of food - Sampling to ensure that a lot is not contaminated with more than a given percentage c) Statistical quality control - Probability of occurrence in normal distribution - Using binomial distribution to determine probability of occurrence - Probability of defective items in a sample obtained from large lot d) Sensory evaluation of food - Statistical descriptors of a population estimated from sensory data obtained from a sample - Analysis of variance * One factor, completely randomized design * For two factor design without replication - Use of linear repression in analyzing sensory data e) Mechanical transport of liquid food - Measuring viscosity of liquid food using a capillary tube viscometer f) Solving simultaneous equations in designing multiple effect evaporators while using matrix algebra available in excel		
3.	3. Familiarization with the application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants, stating from the receiving of raw material up to the storage & dispatch of finished product (10 hrs)	10	20
4.	4. Basic Introduction to computer aided manufacturing (10 hrs) Application of computers in instrumentation and control of food machinery, inventory control, process control etc.	10	20
5.2 FOOD ADDITIVES			

1.	1. Food additives – definition and importance (4 hrs)	4	10
2.	2. Classification, functions and uses of food additives: (36 hrs) - Preservatives - Antioxidants - Mould Inhibitors - Emulsifiers - Acids, bases, salts and buffering agents - Anti-cacking agents - Flour maturing and bleaching agents - Colourants - Flavouring agents - Texture modifiers,stabilizers, thickeners - Humactants - Leavening agents - Low and non-calorie sweetening agents - Fat replacers	36	60
3.	3. Stability of food additives during processing (4 hrs)	4	15
4.	4. Legal standards and permissible limits of food additives (4 hrs)	4	15
5.3 HEALTH AND FUNCTIONAL FOODS			
1.	1. Introduction – definition, status and scope of health and functional foods in India (2 hrs)	2	5
2.	2. Definition of nutraceuticals and their importance (5 hrs)	5	5
3.	3. Types of health and functional foods and their properties (5 hrs)	5	5
4.	4. Various food constituents responsible for functional effects (10 hrs) - Anti-carcinogenic, hypocholesterolemic and hypoglycemic foods - Dietatic foods - Fortified foods - Biofedic and probiotic foods	10	20
5.	5. Processing of health and functional foods, criteria for selection of raw materials,	6	15

	and their processing (6 hrs)		
6.	6. Storage, packaging and labeling of health and functional food (4 hrs)	4	10
7.	7. Marketing aspects of health and functional foods (4 hrs)	4	10
8.	8. Legal aspects of health and functional foods (4 hrs)	4	10
9.	9. Export potential of health and functional foods (4 hrs)	4	10
10.	10. Organic foods and Genetically Modified (GM) foods in relation to health (4 hrs)	4	10
	5.4 INSTRUMENTATION AND PROCESS CONTROL		
1.	1. Basic Building Blocks of any Instrumentation Systems (2 hrs) ▪ Scope and necessity of instrumentation ▪ Names of important process variables, their units ▪ Building blocks of instrumentation system ▪ Various testing signal	2	10
2.	2. Basic Concepts (4 hrs) ▪ Definition of the terms accuracy, precision sensitivity, linearity, hysteresis gauge factor etc	4	6
3.	3. Variable Resistance Transducers (5 hrs) ▪ Construction, working, principle and applications of potentiometers, strain gauge, load cell ▪ Hot wire anemometers, photo resistors, humidity sensor ▪ Resistive temperature transducers ▪ Thermistors	5	12
4.	4. Variable Inductance Transducers (5 hrs) 4.1 Basic principles 4.2 Electromagnetic pick up 4.3 Induction potentiometer 4.4 Linear variable differential transformer (LVDT) 4.5 Variable reluctance transducers	5	12
5.	5. Flow Measurements (4 hrs)	4	10

	Flow measurement with orifice, magnetic, ultrasonic, vortex flow meters		
6.	6. Level Measurements (6 hrs) Level detectors, float level devices, level gauges, optical level devices, radiation level sensors, thermal level sensors	6	12
7.	7. Temperature Measurement (6 hrs) Temperature sensors – thermocouples, RTDs, thermistors, radiation thermometery, IR dectors, fibre-optic temperature sensor; acoustic phrometer	6	12
8.	8. Pressure Measurement (6hrs) Pressure sensors, below, diaphragm, bourdon and helical types, electronic pressure sensor, manometers, pressure gauges, vacuum sensors, high-pressure sensors, pressure repeaters	6	12
9.	9. Measurement systems for density humidity, dry bulb temperature, wet bulb temperature, Degree brix, specific gravity (4 hrs)	4	6
10.	10. Instrumentation and Safety (6 hrs) Alarm and shutdown devices, safety interlock systems; Computer control system – introduction to SDC and DDC and their applications in process industries	6	8
5.5 TECHNOLOGY OF OILS & FATS			
1.	1. Introduction (6 hrs) Oils and Fats, sources and composition, physico-chemical properties of oil & fats	6	20
2.	2. Nutritional importance of oils and fats (2 hrs)	2	6
3.	3. Function of oil and fats in food (4 hrs) - Tenderness - Texture - Flavor - Emulsion	4	8
4.	4. Processing of oil and fats (4 hrs) Pretreatment, rendering, pressing, extraction methods, refining, bleaching,	4	20

	hydrogenation, fractionation, deodorizing, plasticizing, packaging		
5.	5. Production and processing of Animal fats (12 hrs) - Butter - Margarine - Lard - Fishoil	12	22
6.	6. Production and processing of vegetable oils (12 hrs) - Soyabean oil - Mustard oil - Groundnut oil - Sunflower oil	12	24
6.1 FOOD PACKAGING TECHNOLOGY			
1.	1. Introduction (2 hrs) Definition, importance and scope of packaging of foods	2	8
2.	2. Packaging Materials (10 hrs) Origin of packaging materials, types, properties, advantages & disadvantages of packaging materials	10	20
3.	3. Types of packaging (8 hrs) Forms of packaging – box, bottle, tetra, pouch, shrink, vacuum, gas, CAP, MAP, asceptic etc.	8	20
4.	4. Brief Introduction to (4 hrs) WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test, puncture test, impact test etc.	4	12
5.	5. Packaging Requirements (16 hrs) Packaging requirements and their selection for raw and processed foods 1.1 Meat, fish, poultry, eggs 1.2 Milk and dairy products 1.3 Fruits and vegetables 1.4 Cereal grains and baked food products 1.5 Beverages 1.6 Snacks	16	26

6.	6. Packaging Machinery (6 hrs) Bottling, can former, form fill and seal machines, bags – their manufacturing and closing, vacuum packs unit, shrink pack unit, tetra pack unit	6	8
7.	7. Package labeling – functions and regulations (2 hrs)	2	6
6.2 FOOD ANALYSIS AND QUALITY CONTROL			
1.	1. Introduction (4 hrs) Concept, objectives and need of quality, quality control and quality assurance	4	6
2.	2. Principles and functions of quality control, quality attributes - qualitative, hidden and sensory, plan and methods of quality control (10 hrs)	10	16
3.	3. Sampling (6 hrs) Definition of sampling, purpose, sampling techniques requirements and sampling procedures for liquid, powdered and granular materials	6	8
4.	4. Physicochemical and mechanical properties (10 hrs) Colour, gloss, flavour, consistency, viscosity, texture and their relationship with food quality	10	16
5.	5. Sensory quality control (12 hrs) Definition, objectives, panel selection and their training, subjective and objective methods, interpretation of sensory results in statistical quality control, TQM and TQC, consumer preferences and acceptance	12	22
6.	6. Food Laws and Regulations in India (8 hrs) Objectives, requirements and benefits of food grades and standards (BIS, AGMARK, PFA, FPO, CAC (Codex Alimantarious Commission)	8	14
7.	7. General Hygiene and Sanitation in food industry (4 hrs)	4	6

8.	8. GMP, HACCP (Hazard analysis and critical control point) and ISO 9000 Series – Objectives and principles (6 hrs)	6	8
9.	9. Layout of quality evaluation and cont rol laboratories (4 hrs)	4	4
6.3 WASTE MANAGEMENT IN FOOD INDUSTRY			
1.	1. Introduction (4 hrs) Types of waste and magnitude of waste generation in different food processing industries; concept scope and maintenance of waste management and effluent treatment	4	8
2.	2. Waste Characterization (12 hrs) Temperature, pH, Oxygen demands (BOD, COD, TOD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues	12	26
3.	3. Environmental protection act and specifications for effluent of different food industries (6 hrs)	6	12
4.	4. By-products and Waste utilization (8 hrs)	8	16
5.	5. Effluent Treatment (12 hrs) 1.1 Pre-treatment of waste: sedimentation, coagulation, flocculation and floatation 1.2 Secondary treatments: Biological oxidation – trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons 1.3 Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters, phosphorous, sulphur, nitrogen and heavy metals removal	12	26
6.	6. Assessment, treatment and disposal of solid waste; concept of vermin-composting and biogas generation (6 hrs)	6	12

6.4 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT			
1.	(1) Entrepreneurship (4 hrs) 1.1 Concept/Meaning 1.2 Need 1.3 Competencies/qualities of an entrepreneur	4	10
2.	(2) Entrepreneurial Support System (6 hrs) 2.1 District Industry Centres (DICs) 2.2 Commercial Banks 2.3 State Financial Corporations 2.4 Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC), Khadi Village and Industries Commission (KVIC), other relevant institutions/organizations/NGOs at State level	6	15
3.	(3) Market Survey and Opportunity Identification (Business Planning) (6 hrs) 3.1 How to start a small scale industry 3.2 Procedures for registration of small scale industry 3.3 List of items reserved for exclusive manufacture in small scale industry 3.4 Assessment of demand and supply in potential areas of growth 3.5 Understanding business opportunity 3.6 Considerations in product selection 3.7 Data collection for setting up small ventures	6	10
4.	(4) Project Report Preparation (6 hrs) 4.1 Preliminary Project Report 4.2 Techno-Economic feasibility report 4.3 Project Viability	6	15
5.	(5) Managerial Aspects of Small Business (8 hrs) 5.1 Principles of Management (Definition, functions of management viz planning, organisation, coordination and control 5.2 Operational Aspects of Production 5.3 Inventory Management 5.4 Basic principles of financial management 5.5 Marketing Techniques 5.6 Personnel Management 5.7 Importance of Communication in business	8	20

6.	(6) Legal Aspects of Small Business (6 hrs) 6.1 Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules 6.2 Factory Act and Payment of Wages Act	6	10
7.	(7) Environmental considerations (6 hrs) 7.1 Concept of ecology and environment 7.2 Factors contributing to Air, Water, Noise pollution 7.3 Air, water and noise pollution standards and control 7.4 Personal Protection Equipment (PPEs) for safety at work places	6	10
8.	(8) Miscellaneous (6 hrs) 8.1 Human relations and performance in organization 8.2 Industrial Relations and Disputes 8.3 Relations with subordinates, peers and superiors 8.4 Motivation – Incentives, Rewards, Job Satisfaction 8.5 Leadership 8.6 Labour Welfare 8.7 Workers participation in management	6	10

6.1 BIOMEDICAL INSTRUMENTATION

L	T	P
4	-	3

DETAILED Unit Wise Marks Weight -age

1. **Cardiovascular system and related equipment**.
(12 hrs)

Marks weight age : 20

Note: Equipment can be shown to students during field visit in V semester.

2. Introduction to Renal equipment
(08 hrs)

Marks weight age : 10

3. Introduction to Central Nervous System equipment
(10 hrs)

Marks weight age : 15

4. Introduction to Hearing and speech (06 hrs)

Marks weight age : 10

5. Introduction to Opthalmologic Equipment (06 hrs)

Marks weight age : 10

6. Reproductive System (08 hrs)

Marks weight age : 15

7. Dental Care (08 hrs)

Marks weight age : 10

8. Alimentary System (06 hrs)

Marks weight age : 10

Total Marks = 100

6.2 INSTALLATION, MAINTENANCE AND SERVICING OF MEDICAL EQUIPMENT

L	T	P
2	-	3

DETAILED Unit Wise Marks Weight -age

1.	**Medical Equipment**	**(06 hrs)**
	Marks weight age : 20	
2.	**Installation of Medical Equipment**	**(06 hrs)**
	Marks weight age : 20	
3.	**Stabilizers, Inverters and power supplies**	**(08 hrs)**
	Marks weight age : 20	
4.	**Safety Aspects**	**(06 hrs)**
	Marks weight age : 20	
5.	**Servicing of Medical Equipment**	**(06 hrs)**
	Marks weight age : 20	

Total Marks = 100

6.3 RADIOLOGY AND IMAGING

L	T	P
3	-	3

DETAILED Unit Wise Marks Weight -age

1.	**Machine used or Medical Diagnosis**	**(20 hrs)**
	Marks weight age : 40	
2.	**Ultrasound Scanners**	**(14 hrs)**
	Marks weight age : 20	
3.	**C.T. Scanner**	**(07 hrs)**
	Marks weight age : 20	
4.	**MRI (Magnetic Resonance Imaging)**	**(07 hrs)**
	Marks weight age : 20	

Total Marks =100

6.4 MODERN COMMUNICATION AND TELEMETRY

L T P
4 - 3

DETAILED Unit Wise Marks Weight -age

1. Introduction (14 hrs)

Marks weight age : 25

2. Multiplexing (10 hrs)

Marks weight age : 15

3. Typical ECG telemetry system (12 hrs)

Marks weight age : 15

4. Obstetrical telemetry system. (06 hrs)

Marks weight age : 10

5. Implantable telemetry system (10 hrs)

Marks weight age : 15

6. Optical Fibre Communication (12 hrs)

Marks weight age : 20

Total Marks = 100

6.5 HOSPITAL MANAGEMENT AND CLINICAL PRACTICES

L T P
3 - -

DETAILED Unit Wise Marks Weight -age

1. The Approach to planning (08 hrs)

Marks weight age : 15

2. Components and functions (12 hrs)

Marks weight age : 30

3. Trends in Hospital care and Economics (06 hrs)

Marks weight age : 15

2. Infection Control (12 hrs)

Marks weight age : 20

5. Maintainability of Engineering Services (10 hrs)

Marks weight age : 20

Total marks = 100

6.6. MAJOR PROJECT WORK

L	P
-	8

A suggestive criteria for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max.** Marks	Rating Scale				
			Exce-llent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4

5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/ communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9	Viva voce	10	10	8	6	4	2
Total marks		**100**	**100**	**80**	**60**	**40**	**20**

III SEMESTER

1. FLUID MECHANICS

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	4	5
2.	2.	6	7
3.	3.	8	8
4.	4.	8	15
5.	5.	8	15
6.	6.	6	15
7.	7.	8	15
8.	8.	10	20
	Total	**58**	**100**

2. GENERAL ENGINEERING

Common with Mechanical

3. SURVEVING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	3	10
2.	2.	3	5
3.	3.	8	30
4.	4.	10	25
5.	5.	8	30
	Total	**32**	**100**

4. CONSTRUCTION MATERIALS

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	4	4
2.	2.	10	10
3.	3.	7	15
4.	4.	4	5
5.	5.	7	25
6.	6.	6	15
7.	7.	4	10
8.	8.	6	10
	Total	**48**	**100**

5. BUILDING CONSTRUCTION

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	1	2
2.	2.	4	5
3.	3.	4	5
4.	4.	8	10
5.	5.	4	10
6.	6.	2	5
7.	7.	6	10
8.	8.	6	8
9.	9.	6	12
10.	10.	4	5
11.	11.	6	5
12.	12.	4	10
13.	13.	4	10

14.	14.	4	3
	Total	**59**	**100**

6. BUILDING DRAWING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	9	5
2.	2.	8	10
3.	3.	8	10
4.	4.	8	10
5.	5.	8	5
6.	6.	12	15
7.	7.	12	20
8.	8.	8	10
9.	9.	16	10
10.	10.	12	5
	Total	**91**	**100**

IV SEMESTER

1. CONCRETE TECHNOLOGY

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	2	2
2.	2.	7	8
3.	3.	7	10
4.	4.	2	5
5.	5.	3	10
6.	6.	4	15

7.	7.	3	15
8.	8.	6	10
9.	9.	12	25
	Total	**46**	**100**

2. WATER SUPPLY AND WASTE WATER ENGINEERING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	1	-
2.	2.	5	10
3.	3.	3	5
4.	4.	3	5
5.	5.	3	5
6.	6.	5	8
7.	7.	5	8
8.	8.	3	5
9.	9.	3	4
10.	10.	2	2
11.	11.	5	10
12.	12.	3	3
13.	13.	3	5
14.	14.	3	3
15.	15.	4	6
16.	16.	2	5
17.	17.	6	10
18.	18.	4	6
	Total	**63**	**100**

3. SOIL AND FOUNDATION ENGINEERING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	3	4
2.	2.	4	8
3.	3.	4	8
4.	4.	4	6

5.	5.	4	6
6.	6.	4	6
7.	7.	5	15
8.	8.	4	4
9.	9.	6	15
10.	10.	4	8
11.	11.	8	20
	Total	**50**	**100**

4. SURVEVING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	6	10
2.	2.	8	25
3.	3.	4	15
4.	4.	6	20
5.	5.	4	15
6.	6.	4	15
	Total	**32**	**100**

5. STRUCTURAL MECHANICS

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	2	2
2.	2.	8	10
3.	3.	12	20
4.	4.	3	13
5.	5.	6	10
6.	6.	6	15
7.	7.	4	10
8.	8.	3	15
9.	9.	4	5
	Total	**48**	**100**

6. PUBLIC HEALTH ENGINEERING DRAWING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	-	10
2.	2.	-	15
3.	3.	-	20
4.	4.	-	20
5.	5.	-	25

6.	6.	-	10
	Total	**-**	**100**

V SEMESTER

1. HIGHWAY ENGINEERING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	2	5
2.	2.	8	15
3.	3.	6	10
4.	4.	6	10
5.	5.	8	15
6.	6.	6	15
7.	7.	4	8
8.	8.	4	11
9.	9.	4	11
	Total	**48**	**100**

2. RAILWAY BRIDGES AND TUNNELS

S.No.	Topic/Unit	Hours Allotted	%age of Marks
PART A			
1.	1.	-	4
2.	2.	-	4
3.	3.	-	4
4.	4.	-	4
5.	5.	-	4
6.	6.	-	4
7.	7.	-	4
8.	8.	-	4
9.	9.	-	4
10.	10.	-	4
		28	**40**
PART B	**BRIDGES**		
11.	11	-	4
12.	12	-	4
13.	13	-	8
14.	14	-	4

15.	15	-	4
16.	16	-	4
17.	17	-	4
18.	18	-	4
		28	**36**
PART C	**TUNNELS**		
19.	19	-	6
20.	20	-	6
21.	21	-	
22.	22	-	
23.	23	-	6
24.	24	-	
25.	25	-	
26.	26	-	6
27.	27	-	
28.	28	-	
		8	**24**
	Total	**32**	**100**

3. IRRIGATION ENGINEERING AND DRAWING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	2	2
2.	2.	3	3
3.	3.	3	3
4.	4.	6	12
5.	5.	4	8
6.	6.	4	4
7.	7.	4	4
8.	8.	4	4
9.	9.	5	10
10.	10.	4	8
11.	11.	3	6
12.	12.	3	6
Drawing			
1.	1.	-	15
2.	2.	-	
3.	3.	-	
4.	4.	-	15
5.	5.	-	
6.	6.	-	
	Total	**45**	**100**

4. QUANTITY SURVEYING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	2	10
2.	2.	4	10
3.	3.	4	5
4.	4.	20	35
5.	5.	12	15
6.	6.	14	25
	Total	**56**	**100**

5. RCC DESIGN AND DRAWING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	3	5
2.	2.	2	
3.	3.	12	10
4.	4.	8	10
5.	5.	6	5
6.	6.	8	10
7.	7.	8	10
8.	8.	6	5
9.	9.	10	10
10.	10.	4	5
Drawing			
1.	1.	-	15
2.	2.	-	
3.	3.	-	
4.	4.	-	15
5.	5.	-	
6.	6.	-	
	Total	**68**	**100**

VI SEMESTER

1. CONSTUCTION MANAGEMENT AND ACCOUNTS

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	6	5
2.	2.	8	10
3.	3.	4	5
4.	4.	4	5
5.	5.	7	10
6.	6.	4	10
7.	7.	6	12
8.	8.	6	13
9.	9.	4	15
10.	10.	7	
11.	11.	8	15
	Total	**71**	**100**

2. ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	4	5
2.	2.	6	15
3.	3.	6	15
4.	4.	6	15
5.	5.	8	20
6.	6.	6	10
7.	7.	6	10
8.	8.	6	10
	Total	**48**	**100**

3. ELECTIVE

ENVIRONMENTAL ENGINEERING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	4	5
2.	2.	2	3
3.	3.	8	15
4.	4.	6	15
5.	5.	2	5
6.	6.	6	15
7.	7.	6	15
8.	8.	4	10
9.	9.	4	10
10.	10.	4	5
11.	11.	2	2
	Total	**48**	**100**

4. STEEL STRUCTURE DESIGN AND DRAWING

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	2	5
2.	2.	12	20
3.	3.	6	5
4.	4.	10	20
5.	5.	8	10
6.	6.	10	10
DRAWING			
1.	-		30
2.	-		
3.	-		
	Total	**48**	**100**

5. EARTHQUAKE RESISTANT BUILDING CONSTRUCTION

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	10	25
2.	2.	2	15
3.	3.	4	8
4.	4.	6	10
5.	5.	6	12
6.	6.	8	15
7.	7.	6	15
	Total	**42**	**100**

6. TENDERING AND VALUATION

S.No.	Topic/Unit	Hours Allotted	%age of Marks
1.	1.	8	20
2.	2.	12	38
3.	3.	6	10
4.	4.	2	5
5.	5.	4	27
	Total	**32**	**100**

2.6 ANALOG ELECTRONICS – I

1. Semi conductor physics: (12 hrs) Marks-20

2. Semi conductor diode: 12 hrs) Marks-20
3. Introduction to Bipolar transistor: (12 hrs) Marks-20
4. Transistor biasing Circuits: (6 hrs) Marks-8

5. Single stage transistor amplifier: (10 hrs) Marks-12

6. Field effect Transistors (12 hrs) Marks-20
Construction, operation and characteristics of FET and its application.

BASIC ELECTRICAL ENGINEERING

1. DC Circuits (5 hrs) Marks-10

2. DC Circuit Theorems (4 hrs) Marks-10

3. Constant Voltage and Constant Current Sources (3 hrs) Marks-8

4. Electro Magnetic Induction (8 hrs) Marks-16

5. Batteries (4 hrs) Marks-12

6. AC Fundamentals (12 hrs) Marks-16

7. AC Circuits (10 hrs) Marks-18
8.. Various Types of Power Plants (2 hrs) Marks-10