Syllabus of the courses where the revision was carried out program wise in the academic year 2021-2022

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Aditya Nagar, ADB Road, Surampalem - 533437, Near Kakinada, E.G.Dt., Ph:99498 76662

Department of Civil Engineering

Syllabus revision Index for the Academic Year 2021-2022 B.Tech Civil Engineering

S.No	Name of the course	Percentage of syllabus change
1.	Irrigation & water resource Engineering	33.2
2.	PE I Construction Technology &Management	50

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Department of Civil Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Water Resource Engineering - I	Irrigation & water resource Engineering
Course Code	171CE5T13	191CE5T09
Syllabus	UNIT –I Introduction: Engineering hydrology and its applications - Hydrologic cycle - Hydrological data-sources of data. Precipitation: Types and forms - measurement - rain gauge network - presentation of rainfall data- average rainfall - continuity and consistency of rainfall data - frequency of rainfall - IntensityDuration-Frequency (IDF) curves - Depth-Area-Duration (DAD) curves - Probable Maximum Precipitation (PMP) - design storm.	UNIT-I: Introduction: Hydrologic cycle – Precipitation - measurement - rain gauge network - presentation of rainfall data - average rainfall - continuity and consistency of rainfall data - frequency of rainfall - Intensity-Duration-Frequency (IDF) curves - Depth-AreaDuration (DAD) curves. Abstractions from precipitation: Evaporation and Evapotranspiration- Factors affecting - measurement and control. Infiltration-Factors affecting - measurement - and infiltration indices. Runoff: Catchment characteristics - factors affecting runoff - stream gauging - Rating curves - flow mass curve and flow duration curve
	UNIT – II Abstractions from precipitation: Initial abstractions - Evaporation- Factors affecting - measurement and reduction. Evapo-transpiration- Factors affecting - measurement and control. Infiltration-Factors affecting - Infiltration capacity curve - measurement - and infiltration indices.	UNIT-II: Hydrograph analysis: Components of hydrograph - separation of base flow - effective rainfall hyetograph and direct runoff hydrograph - unit hydrograph,-assumptions - derivation of unit hydrograph - unit hydrographs of different durations - principle of superposition and S-hydrograph methods - Instantaneous unit hydrograph - limitations and applications of unit hydrograph. Floods and Flood Routing: Causes and effects - flood frequency analysis- Gumbel's and Log-Pearson type III distribution methods - Standard Project Flood (SPF) and Probable Maximum Flood (MPF) - flood control methods - Hydrologic routing - Muskingum and Modified Puls methods of routing.
	UNIT–III Runoff: Catchment characteristics - factors affecting runoff - components - computation-empirical formulae - tables and curves - stream gauging - Rating curves -	UNIT-III: Irrigation: Types of irrigation systems - soil moisture constants - irrigation water requirements - consumptive use and its estimation - duty and delta - factors affecting - depth and frequency of irrigation Groundwater: Occurrence

Head of the Department

	flow mass curve and flow duration curve - rainfall-runoff modeling. Hydrograph analysis: Components of hydrograph - separation of base flow - effective rainfall hyetograph and direct runoff hydrograph - unit hydrograph,-assumptions - derivation of unit hydrograph - unit hydrographs of different durations - principle of superposition and S-hydrograph methods - Instantaneous unit hydrograph - limitations and applications of unit hydrograph.	- types of aquifers - aquifer parameters - porosity - specific yield - permeability - transmissivity and storage coefficient Diversion Head Works: Types of diversion head works - weirs and barrages - layout of diversion head works - components. Bligh's creep theory - Khosla's theory - design of impervious floors for subsurface flow – exit gradient.
	UNIT – IV Floods: Causes and effects - flood frequency analysis- Gumbel's and Log-Pearson type III distribution methods - Standard Project Flood (SPF) and Probable Maximum Flood (MPF) - flood control methods and management. Flood Routing: Hydrologic routing - channel and reservoir routing - Muskingum and Modified Puls methods of routing	UNIT-IV: Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity - design of erodible canals -Kennedy's silt theory and Lacey's regime theory Canal Structures: Falls - Types and location Canal Regulation and Cross Drainage works: Head and cross regulators - design principles - Types and selection of cross drainage works - design principles of aqueduct - siphon aqueduct and super passage - canal outlets-types - proportionality - sensitivity and flexibility.
	UNIT – V Groundwater: Occurrence - types of aquifers - aquifer parameters - porosity - specific yield - permeability - transmissivity and storage coefficient - types of wells - Darcy's law - Dupuit's equationsteady radial flow to wells in confined and unconfined aquifers - yield of a open wellrecuperation test	UNIT-V: Reservoir Planning and Dams: Investigations - site selection for reservoir and dams - zones of storage. Earth Dams: Types, causes of failure - criteria for safe design - seepage - measures for control of seepage-filters - stability analysis-stability of downstream slope during steady seepage and upstream slope during sudden drawdown conditions. Gravity dams and Spillways: Forces acting on a gravity dam - causes of failure of a gravity dam - elementary and practical profile of a gravity dam - limiting height of a dam - stability analysis - Types of spillways - design principles of Ogee spillways - types of spillway crest gates - energy dissipation below spillways - stilling basin and its appurtenances - tail water rating curves

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Department of Civil Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	(PE I)Construction Technology and . Management	PE I Construction Technology &Management
Course Code	171CE5E01	191CE5E02
Syllabus	UNIT –I: Introduction: Steps involved in planning - Objectives – Principles – Advantages - Limitations - Stages of planning - Scheduling - Preparation of construction schedules -Methods of scheduling - Bar charts -Mile stone charts – Controlling - Project work break down.	UNIT-I: Preliminary Planning Organisational Aspects: Importance of Construction Sector , Definition of Construction Management ,Need for Construction Management Factors Involved in Construction or , Objectives of Construction Management Importance of Planning Aspects to be Considered During Preliminary Planning of Different Projects ,Feasibility Report , Site Investigation ,Project Report , Organisation , Different Engineering Departments of the Government , Organisational Structure of Engineering Department ,Duties of Different Officers ,Administrative Approval ,Technical Sanction , Budget Provision.
	UNIT – II: Project Management Through Networks: Objectives of network techniques - Fundamentals of network analysis - Events; Activities- Dummies - Types of networks - Choice of network type - Advantages of network techniques over conventional techniques. Program Evaluation and Review Technique (PERT): Introduction - Earliest expected time - Latest allowable occurrence time - Slack - Critical path - Probability of completion time for a project.	UNIT-II: Construction Planning, Contract and Tenders construction planning, construction stage, Construction Operations, Scheduling, Types of Scheduling , Methods of Scheduling ,Scheduling of Network Analysis, CPM and PERT ,Difference Between PERT" AND "CPM" ,Terminology in CPM ,Conventions Followed ,Steps in Critical Path, Advantages of CPM Network in Execution of a Project ,Problems on CPM , Caused of Accidents in Construction Industry ,Effects of

Head of the Department

		Accidents ,Safety Measures at the Construction site Contract& Tenders: Definition, legal obligation of contract, contract document, types of contracts, Necessity of Tenders , Differences Between Tender and Agreements , Tender Notice , Draft Tender Notice , Tender Documents ,Short Tender Notice ,Earnest Money Deposit and Security Deposit , Opening of Tenders ,Scrutiny of Tenders , Comparative Statement ,Acceptance of Tender , Work Order ,Contract Agreement.
	UNIT – III: Critical Path Method (CPM): Introduction-Difference between CPM and PERT-Time estimates- Earliest event time- Latest event time- Float- Critical activities and critical path. Cost Control: Direct cost-indirect cost-total project cost-Optimization of cost through networks-Steps involved In optimization of cost- allocation of resources	UNIT-III: Execution of work, payment of bills and stores: Introduction, regular establishment, work charged establishment, duties of super visor/junior engineer/assistant execution engineer, need for inspection of works by DEE and E. E, duties of the deputy executive engineer, duties of executive engineer, need of super vision, Principles or supervision ,Necessity for Sampling and Testing , Departmental Execution of Work , Nominal Muster Roll (N.M.R): N M.R Format, Rules Regarding Preparation of Muster Roll , Common Irregularities in Muster Rolls, Imprest ,Measurement Book-M' BOOK ,Rules to be Followed in Recording Measurements ,Pre-Measurement , Check Measurement , Contractor's Acceptance of Measurements , Preparation of Bills , Types of Bills ,Mode of Payment ,Checking of Bills , Recoveries to be Made from Bills , Stores , Classification of Stores , General Stock Items ,Materials Charged to Works ,Plant and Machinery , Small Tools and Plants ,Storage of Stock. Record Keeping in Stores , ,Receipts, Issues , Indents ,Invoice , Bin Card Unstamped Receipt (U.S.R) ,Transfer Entry Order ,Materials at Site Account , Issue Rate ,Stock Register , Verification of Stores ,Accounting of Surpluses,

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		Accounting of Shortages ,Survey Report and Write Off , Central Stores
	UNIT – IV: Construction Equipment: Classification of construction equipment- Earth moving equipmentcapacities of trucks and handling equipment-calculation of truck production- Excavation equipment-Hauling equipment- Earth compaction equipment- Hoisting equipment.	UNIT-IV: TQM and quality management ISO, CONCEPT OF QUALITY, quality and sales, quality system, elements of quality system, contract review(CLAUSE 4.3), design control IS 9001(CLAUSE 4.4),Document Control (Clause 4.5) ,Purchasing (Clause 4.6) ,Purchaser Supplied Product (Clause 4.7) , Product Identification and Traceability: ISO 9001 (4.8) , Process Control (Clause 4.9) ISO 9001: 1994, Inspection and Testing ,Quality Assurance ,Indian Standards on Quality Systems ,Evolution of ISO 9000, ISO 9000 Certification- Importance , Outstanding Features of ISO 9000 Series of Standards , Limitations or Drawbacks of ISO 9000 ,Total Quality management (T.O.M), Need for TOMI , Steps Involved in TOM , Benefits of TOM , ISO-9000 and TOM
	UNIT – V: Aggregate & Concreting Equipment: Crushers & Types of crushers-selection of crushing equipment- concrete mixers- mixing and placing of concrete- consolidating and finishingPiling & Pile driving equipment - form work- fabrication and erection	UNIT-V: Quality control in Construction and tolerance levels Introduction, quality control, elements of quality, quality control methods, Control Aspects of Batching and Mixing, Mixing of Concrete ,Inspection of Reinforcement Grills , Inspection and Examination of Formwork, Relationship Between the Strength of Brick Work and Strength of Mortar ,Quality of the Filler Materials ,Construction Tolerance ,Tolerances Levels in Construction Industry , Dimensional Accuracies ,Visual Appearance.

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Department of Electrical and Electronics Engineering

Syllabus revision Index for 2021-2022

S. No	Name of the course	Percentage of syllabus change
1	Analog Electronic Circuits	50
2	DC Machines and transformers	20
3	Microprocessor & Interfacing	35

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Department of Electrical and Electronics Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Analog Electronic Circuits**	**Analog Electronic Circuits**
Course Code	**191EE3T02**	**201EE3T01**
Syllabus	**UNIT-I: Review of Semi-Conductor Physics**: Insulators, Semiconductors, and Metals classification using Energy Band Diagrams, Mobility and Conductivity, Electrons and holes in Intrinsic Semiconductors, Extrinsic Semi-Conductor, (P and N Type semiconductor) Hall effect, Generation and Recombination of Charges, Diffusion. **Junction Diode Characteristics:** Operation and characteristics of p-n junction diode. Current components in p-n diode, diode equation. Temperature dependence on V–I characteristic, diffusion capacitance and diode resistance (static and dynamic), energy band diagram of p-n diode. Special Diodes: Avalanche and Zener break down, Zener characteristics. Light Emitting Diodes.	**UNIT – I: Junction Diode Characteristics**: Review on semiconductor materials, Open circuited PN junction, energy band structure of open circuited PN junction, forward and reverse bias of PN junction, current components in PN junction diode, drift and diffusion currents, law of junction, diode current equation, Breakdown mechanisms, V-I Characteristics, temperature dependence of V-I characteristics, static and dynamic diode resistances, Diffusion and Transition capacitances. Special Semiconductor Diodes: Operation and characteristics of different diodes like Zener Diode, Zener diode applications, LED, Photo diode, Tunnel Diode, Varactor Diode and UJT.
	UNIT-II: Rectifiers and Regulators: Half wave rectifier, ripple factor, full wave rectifier (with and without transformer), harmonic components in a rectifier circuit, Basic filters. Simple circuit of a regulator using Zener diode. Types of regulators-series and shunt voltage regulators, overload protection of voltage regulators. Clipper and Clamper circuits	**UNIT – II: Rectifiers:** Block diagram and requirements of Linear mode power supply, Types of rectifiers and their operation, input and output waveforms, derivations of parameters of rectifiers. Filters: Inductor filter, Capacitor filter, L-section filter, π-section filter, multiple L section and multiple π - section filters, comparison of various filter circuits in terms of ripple factor.

	UNIT-III: Transistors and FET: Junction transistor, transistor current components, transistor as an amplifier and switch. Characteristics of transistor (CE, CB and CC configurations). Transistor biasing and thermal stabilization (to fixed bias, collector to base bias, self-bias). Basics of Field Effect Transistors - Enhancement and depletion mode transfer and drain characteristics.	**UNIT – III Transistor Characteristics:** BJT: Construction and operation of a transistor, transistor current components, transistor current equation, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/reach through, typical transistor junction voltage values. FET: Construction, operation, characteristics and parameters of JFET, depletion and enhancement mode MOSFETs, comparison between JFET and MOSFET.
	UNIT-IV: Feedback Amplifiers: Classification, feedback concept, transfer gain and general characteristics of negative feedback amplifiers, effect of feedback on input and output resistances. Methods of analysis of feedback amplifiers.	**UNIT – IV: Transistor Biasing and Thermal Stabilization:** Need for biasing, load line analysis, basic stability and stability factors (S, S', S''), BJT biasing methods, fixed bias, collector to base bias, self-bias, Stabilization against variations in VBE, Ic0 and β, Bias compensation, Thermal runaway, Thermal stability, FET Biasing methods and stabilization
	UNIT-V: Power Amplifiers: Classification, push-pull amplifiers, Introduction to harmonics (distortion factor). Oscillators: Condition for oscillation, RC-phase shift oscillator. We in bridge oscillator, Crystal oscillator. Frequency and amplitude stability of oscillator.	**UNIT – V Small Signal Low Frequency Transistor Amplifier Models:** BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers. FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Electrical Machines-I**	**DC Machines and transformers**
Course Code	**191EE3T04**	**201EE3L01**
Syllabus	**UNIT-I: Electro Mechanical Energy Conversion:** Principles of electromechanical energy conversion- Magnetic Materials, Permanent Magnets, Electromagnets, B-H Curve – Energy, Co-energy – Forces of electromagnetic origin – Single and multiple excited magnetic field system – Elementary concepts of rotating machines – mmf of distributed winding - Rotating magnetic field – Torque – Magnetic Leakage.	**UNIT – I: Electromechanical Energy Conversion and introduction to DC machines:** Principles of electromechanical energy conversion - singly excited and multi excited systems calculation of force and torque using the concept of co-energy. Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques– characteristics of DC shunt generator –applications of DC Generators
	UNIT-II: DC Generator: DC Generator- Construction – Lap and wave winding – emf equation-excitation and types of generators-Characteristics - armature reaction-methods of improving commutation-power flow diagram-testing (Hopkinson's test, Field test)-Voltage Regulation-Applications.	**UNIT – II: Operation of DC Motors:** Back-emf and torque equations of dc motors – Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors – losses and efficiency – applications of dc motors. Necessity of a starter – starting by 3 point and 4-point starters.
	UNIT-III: DC Motor: DC Motor– Types -Torque equation - Back emf and voltage equations - Characteristics- Starting Speed control - Testing: direct, indirect and regenerative tests-Power flow, efficiency and separation of losses-Retardation test.	**UNIT – III: Speed Control of Motors and Testing of DC Machines & Single-phase Transformers:** Speed control by armature voltage and field control – testing of DC machines – brake test, Swinburne's method – principle of regenerative or Hopkinson's method – retardation test – field's test-separation of losses. Types and constructional details – principle of

		operation –emf equation – operation on no load and on load – lagging, leading and unity power factors loads –phasor diagrams of transformers – equivalent circuit.
	UNIT-IV: Single Phase Transformer: Transformers - Types and constructional details - Principle of operation - Emf equation –Phasor diagrams of transformers – Lagging, leading and unity power factors loads - Equivalent circuit – Regulation – Losses and efficiency – Effect of variation of frequency and supply voltage on losses – All day efficiency.	**UNIT – IV: Performance and Testing of Transformers and Auto Transformers:** Regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency. Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test – separation of losses – parallel operation with equal voltage ratios – auto transformer – equivalent circuit – comparison with two winding transformers
	UNIT-V: Single-Phase Transformers Testing: Tests on single phase transformers – Open circuit and short circuit tests – Sumpner's test – separation of losses – Parallel operation with equal voltage ratios – Auto transformer - Equivalent circuit – Comparison with two winding transformers. **3-Phase Transformer** Poly phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ - Third harmonics in phase voltages - Three winding transformers - Determination of Zp, Zs and Zt- Transients in switching - Off load and on load tap changers - Scott connection.	**Unit – V Three Phase Transformers:** Poly phase connections- Y/Y, Y/ Δ, Δ/Y, Δ/ Δ and open Δ- third harmonics in phase voltages – three winding transformers- transients in switching – off load and on load tap changers-Scott connection.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Micro Processor and Micro Controllers**	**Microprocessor & Interfacing**
Course Code	**171EE6T16**	**191EE6T13**
Syllabus	**UNIT I: Introduction to Microprocessor architecture:** Introduction and evolution of Microprocessors, Architecture of 8086, Register Organization of 8086, Memory organization of 8086, General bus operation of 8086, Introduction to 80286,80386 and 80486 and Pentium.	**UNIT-I: Introduction to Microprocessor Architecture** Introduction and evolution of Microprocessors – Architecture of 8086 – Memory Organization of 8086 – Register Organization of 8086 – Instruction sets of 8086 – Addressing modes – Assembler directives – Introduction to 80286, 80386, 80486 and Pentium (brief description about architectural advancements only).
	UNIT II: Minimum and maximum mode operations: Instruction set, addressing modes, assembler directives, Minimum and Maximum mode operations of 8086, 8086 Control signal interfacing, Read and write cycle timing diagrams.	**UNIT-II: Minimum and Maximum Mode Operations:** General bus operation of 8086 – Minimum and Maximum mode operations of 8086 – 8086 Control signal interfacing – Read and write cycle timing diagrams.
	UNIT III: 8086 interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8259 programmable interrupt controller, Intel 8237a DMA controller, Intel 8255 programmable peripheral interface, Intel 8279 programmable keyboard/display controller, keyboard interfacing, stepper motor, A/D and D/A converters.	**UNIT-III: Microprocessors I/O interfacing – I:** 8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255–Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086.
	UNIT IV: Introduction to 8051 micro controllers: Overview of 8051 Micro Controller, Architecture, Register set, I/O ports	**UNIT-IV: Microprocessors I/O interfacing – II** Architecture and interfacing of 8251 USART – Architecture and interfacing

	and Memory Organization, Interrupts, Timers and Counters, Serial Communication. **PIC architecture:** Block diagram of basic PIC 18 micro controller, registers I/O ports.	of 8254 Timer/counter – Architecture and interfacing of DMA controller (8257) – Architecture 8259 Programmable Interrupt Controller (8259) – Command words and operating modes of 8259 – Interfacing of 8259 – Architecture of Keyboard/display controller (8279) – Modes of operation – Command words of 8279 – Interfacing of 8279.
	UNIT V: Cyber physical systems and industrial applications of 8051: Applications of Micro Controllers, Interfacing 8051 to LED's, Push button, Relay's and Latch Connections, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing.	**UNIT-V: 8051 Microcontroller:** Overview of 8051 Microcontroller – Architecture– Memory Organization – Register set – I/O ports and Interrupts – Timers and Counters – Serial Communication – Interfacing of peripherals Instruction set.

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Department of Mechanical Engineering

Syllabus revision Index (2021-22)

S. No	Name of the course	Percentage of syllabus change
1	Theory of Machines-I	20
2	Fluid Engineering	40
3	Mechanical Vibrations	25
4	Mechatronics	20
5	Additive Manufacturing	40

Program Coordinator

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Department of Mechanical Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Kinematics of Machinery**	**Theory of Machines-I**
Course Code	**191ME4T08**	**201ME4T04**
Syllabus	**UNIT I:** **Classification of mechanisms-** Basic kinematic concepts and definitions- Degree of freedom, mobility- Grashof's law, Kinematic inversions of four bar chain and slider crank chains-Limit positions- Mechanical advantage- Transmission angle- Description of some common mechanisms- Quick return mechanism, straight line generators- Universal Joint- Rocker mechanisms.	**UNIT I:** **Classification of Mechanisms-** Basic kinematic concepts and definitions- Degree of freedom, mobility- Grashof's law, Kinematic inversions of four bar chain -Limit positions- Mechanical advantage- Description of some common mechanisms- Crank and Slotted Lever mechanism, Quick Return Motion mechanism, Davis and Ackermann Steering gear mechanisms, Hooke's joint.
	UNIT II: **Kinematics:** Plane motion of body: Instantaneous centre of rotation, centrode and axode - relative motion between two bodies – Kennedy's three centres in line theorem – Graphical determination of instantaneous centre for simple bar four bar and single slider crank chain mechanisms and determination of angular velocity of points and links. **Motion of a link in machine** - Determination of Displacement, velocity and acceleration for a Simple Four Bar Mechanism, Single slider crank chain mechanism, Double slider crank chain mechanism (Whitworth Quick Return Motion mechanisms).	**UNIT II:** **Kinematics:** Plane motion of body: Instantaneous centre of rotation, centrode and axode - Relative motion between two bodies – Kennedy's Theorem – Graphical determination of instantaneous centre for Four bar and Single Slider Crank chain mechanisms, Determination of Angular Velocity of points and links. **Motion of a Link in Machine** - Determination of Displacement, Velocity and Acceleration for a Four Bar Mechanism, Single Slider Crank chain mechanism, Double Slider Crank chain mechanism
	UNIT III: **Cams:** Definition and classification of cams and followers - their uses - Terminology - Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation, Cycloidal	**UNIT III:** **Cams:** Definition and classification of Cams and Followers - Terminology - Types of follower motion: Uniform velocity, Simple harmonic motion and Uniform Acceleration and Retardation, Cycloidal

	motion for Knife edge, Flat face and Roller follower and offset follower.	motion for Knife edge, Flat face and Roller follower and offset follower.
	UNIT-IV: **Power Transmission:** Introduction –Modes of power transmission applications. **Gears and Gear Trains:** Classification, Terminology, Law of Gearing, path of contact, arc of contact. Interferences, methods of avoiding interferences. Simple gear train, compound gear train, reverted gear train, epicyclical gear train and Differential.	**UNIT-IV:** **Power Transmission:** Introduction –Modes of Power Transmission applications. **Gears and Gear Trains:** Classification, Terminology, Law of Gearing, Path of contact, Arc of contact. Interference, Methods of avoiding interferences. Simple gear train, Compound gear train, reverted gear train, epicyclic gear train and Differential. Table method to find velocity of components of a gear train.
	UNIT-V: **Practical Applications:** Design and fabrication of any one of the following mechanisms: Whitworth Quick Return Mechanism, Oscillating Cylinder Mechanism, Elliptical Trammel, Manual/Motorized Scotch Yoke Mechanism Piston, Bench Tapping Machine, Mini Conveyor using Geneva Mechanism, Mini Hacksaw Powered by Beam Engine.	**UNIT-V:** **Turning Moment Diagrams:** Static and dynamic force analysis of planar mechanisms, Dynamic force analysis of slider crank mechanism, Inertia Torque, Angular Velocity and Acceleration of connecting rod, Crank Effort and Turning Moment Diagrams – Fluctuation of energy – Fly Wheel design.

Course Coordinator

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Fluid Mechanics & Hydraulic Machinery**	**Fluid Engineering**
Course Code	**171ES3T14**	**191ME5E03**
Syllabus	**UNIT-I:** **Fluid Statics:** Dimensions and units: Physical properties of fluids–Mass, Density, Specific weight, Specific volume, Specific gravity, Viscosity, Surface tension, Vapor pressure and their influence on fluid motion. Atmospheric pressure, Gauge pressure and vacuum pressure, Measurement of pressure Piezometers, U-tube and differential manometers. **Buoyancy and Flotation:** Meta center, Stability of floating body. Submerged bodies. Calculation of metacentric height. Stability analysis and applications. **Fluid Kinematics:** Streamline, Path line and streak lines and stream tubes, Classification of flows ideal fluid and real fluid–steady and unsteady flows, Uniform and non-uniform flows, Laminar and turbulent flows, Rotational and irrational flows, Equation of continuity for one-dimensional flows.	**UNIT-I:** **Compressors:** Classification Positive displacement and roto dynamic machinery Power producing and power absorbing machines, Fan, Blower and Compressor Positive displacement and dynamic types Reciprocating and rotary types. **Reciprocating Compressor:** Principle of operation, Work required, Isothermal efficiency, Volumetric efficiency and effect of clearance, Multi stage compression, Under cooling, Saving of work, Minimum work condition for two stage compression.

	UNIT-II: **Fluid Dynamics:** Various forces acting on a fluid element- Euler's and Bernoulli's equation for flow along a stream line, Momentum equation and its applications for pipe bend problem. **Closed Conduit Flow:** Reynolds number, Reynolds experiment–"Darcy–Welsbach" equation–Minor losses in pipes, Pipes in series and pipes in parallel, Total energy line, Hydraulic gradient line.	**UNIT-II:** **Rotary Compressor (Positive Displacement Type):** Roots Blower, Vane sealed compressor, Lysholm compressor, Mechanical details and Principle of working Efficiency considerations. **Centrifugal Compressors:** Mechanical details and principle of operation Velocity and pressure variation. Energy transfer-Impeller blade shape-losses, Slip factor, Power input factor, Pressure coefficient and adiabatic coefficient Velocity diagrams Power. **Axial Flow Compressors:** Mechanical details and principle of operation Velocity triangles and energy transfer per stage degree of reaction, Work done factor - Isentropic efficiency- Pressure rise calculations Polytropic efficiency.
	UNIT-III: **Boundary Layer Theory:** Introduction, Momentum Integral equation, Displacement, Momentum and energy thickness. **Dimensional Analysis:** Dimensionless numbers. **Impact of Jet on Vanes:** Hydrodynamic force on jets on stationary and moving flat, Inclined and curved vanes, Jet striking centrally and at tip, Velocity diagrams, Work done and efficiency, Flow over radial vanes.	**UNIT-III:** **Hydraulic Machines: Turbines** Velocity Triangles and Work done for a Pelton Wheel, Design of Pelton Wheel, Radial Flow reaction Turbines- Inward & Outward; Degree of reaction; Francis Turbine; Axial Flow Reaction Turbines; Draft Tube; Specific Speed; Unit Quantities; Characteristic curves of Hydraulic turbines and governing of turbines.
	UNIT-IV: **Hydraulic Turbines:** Classification of turbines–Impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine–Working principles, Work done, Efficiencies, Hydraulic design, Draft tube theory, Functions and efficiency.	**UNIT-IV:** **Centrifugal Pumps:** Work done by the Centrifugal Pump; Heads and efficiencies; Minimum speed to start, Multistage, Specific speed, Model testing; Priming; Characteristic curves; Cavitation; Maximum suction Lift; Net positive Suction Head.

	Performance of Hydraulic Turbines: Geometric similarity, Unit and specific quantities, Characteristic curves, Governing of turbines, selection of type of turbines, Cavitation's, Surge tank, Water hammer.	
	UNIT -V: **Centrifugal and Reciprocating Pumps:** Classification, working of centrifugal pump, Work done– Manometric head–Losses and efficiencies– Specific speed pumps in series and parallel, Performance characteristic curves, NPSH. Working of Reciprocating pumps, Discharge, slip, Percentage slip and Indication diagrams.	**UNIT-V:** **Reciprocating Pumps:** Discharge, Work done and power required calculations; Slip; Variation of velocity and acceleration in suction and delivery pipes; Effect of variation of velocity on friction in the suction and delivery pipes; Indicator diagram; Air vessels and Comparison of Centrifugal and Reciprocating Pumps.

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Department of Mechanical Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Mechanical Vibrations	Mechanical Vibrations
Course Code	171ME5E02	191ME5E04
Syllabus	**UNIT-I:** **Introduction:** Simple harmonic motion, Terminology, Newton's Law, D'Alembert's Principle, Resonance, Introduction to mechanism of damping, Damped and Undamped oscillations, Degrees of freedom, Various mechanisms of damping, Equivalent viscous damping.	**UNIT-I:** **Single degree of Freedom systems:** Undamped and damped free vibrations: forced vibrations ; coulomb damping; Response to harmonic excitation; rotating unbalance and support excitation, Vibration isolation and transmissibility.
	UNIT-II: **Single Degree of Freedom Systems**: Undamped and damped free vibrations, Forced vibrations, Coulomb damping, Response to harmonic excitation, Rotating unbalance and support excitation, Vibration isolation and transmissibility, Vibrometers, Velocity meters & Accelerometers.	**UNIT-II:** **Vibration Measurement:** Vibrometers, velocity meters & accelerometers Two degree of freedom systems: Principal modes – undamped and damped free and forced vibrations; undamped vibration absorbers.
	UNIT-III: **Two Degree & Multi Degree Freedom Systems:** Principal modes, other cases, Combined rectilinear and angular models, System with damping, Vibration absorbers, Undamped forced vibrations with harmonic excitation, Multi degree freedom with exact analysis.	**UNIT-III:** **Multi degree of freedom systems:** Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi – rotor systems and geared systems; Discrete Time systems.
	UNIT-IV: **Numerical Methods:** Rayliegh's, Stodola's, Matrix iteration, Rayleigh-Ritz Method and Holzer's methods	**UNIT-IV:** **Numerical Methods:** Rayleigh's, stodola's, Matrix iteration, Rayleigh-Ritz Method and Holzer's methods

	UNIT-V: **Application of Concepts:** Critical speeds of shafts with and without damping, Single and multi-disc, Cantilever shaft with large heavy disc, Free vibration of strings – Longitudinal oscillations of bars-Transverse vibrations of beams-Torsional vibrations of shafts, Secondary critical speed. Introduction to Condition Monitoring, FFD Analyzer.	**UNIT-V:** **Application of concepts:** Free vibration of strings – longitudinal oscillations of barstransverse vibrations of beams- Torsional vibrations of shafts. Critical speeds without and with damping, secondary critical speed.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Mechatronics	Mechatronics
Course Code	171ME7T17	191ME6E08
Syllabus	**UNIT-I:** **Mechatronics systems:** Elements & levels of mechatronics system, Mechatronics design process, System, Measurement systems, Control systems, Microprocessor-based controllers, Advantages and disadvantages of mechatronics systems. Sensors and transducers: Types, Displacement, Position, Proximity, Velocity, Motion, Force, Acceleration, Torque, Fluid pressure, Liquid flow, Liquid level, Temperature and light sensors.	**UNIT-I:** **Mechatronics systems:** Elements & levels of mechatronics system, Mechatronics design process, System, Measurement systems, Control systems, Microprocessor-based controllers, Advantages and disadvantages of mechatronics systems, Introduction to electrical vehicle. **Sensors and Transducers:** Types, Displacement, Position, Proximity, Velocity, Motion, Force, Acceleration, Torque, Fluid pressure, Liquid flow, Liquid level, Temperature, and light sensors.
	UNIT-II: **Solid state and digital electronic devices:** DIAC, TRIAC and LEDs. Analog signal conditioning, Operational amplifiers, Noise reduction, Filtering, Digital electronics and systems, Digital logic control, microprocessors and micro controllers.	**UNIT-II:** **Solid State Electronic Devices:** DIAC, TRIAC and LEDs. Analog signal conditioning, Operational amplifiers, Noise reduction, Filtering. Microprocessors and micro controllers. Introduction – Architecture of 8085 – Pin Configuration – Addressing Modes -Instruction set, Timing diagram of 8085 – Concepts of 8051 microcontroller – Block diagram.
	UNIT-III: **Hydraulic and pneumatic actuating systems:** Fluid systems, Hydraulic systems, and pneumatic systems, Components, Control valves, Electro-pneumatic, Hydro-pneumatic, Electro-hydraulic servo systems. Mechanical and Electrical actuating systems: Mechanical	**UNIT-III:** **Hydraulic and pneumatic actuating systems:** Fluid systems, Hydraulic systems, and pneumatic systems, Components, Control valves- pressure and direction, Electro-pneumatic, Hydro-pneumatic, Electro-hydraulic servo systems. Mechanical and Electrical actuating systems:

	actuating systems and electrical actuating systems – basic principles and elements.	Mechanical actuating systems and electrical actuating systems – basic principles and elements.
	UNIT-IV: **Programmable logic controller:** Basic Structure – Memory - Input / Output Processing – Programming – Mnemonics – Timers, Internal relays and counters – Shift Registers – Master and Jump Controls – Data Handling – Analogs Input / Output – Selection of a PLC – PLC Applications	**UNIT-IV:** **Programmable logic controller:** Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters, and internal relays – Data handling – Selection of PLC. Digital electronics: Digital electronics and systems, number systems, Boolean algebra. Digital logic control-logic gates-map.
	UNIT-V: **Dynamic models and analogies:** System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trends. System and interfacing and data acquisition: Data Acquisition Systems, Analog to Digital and Digital to Analog conversions; Digital Signal Processing – data flow in DSPs, Block diagrams, Typical layouts, Interfacing motor drives.	**UNIT-V:** **System and interfacing and data acquisition:** Data Acquisition Systems, Analog to Digital and Digital to Analog conversions; Digital Signal Processing – data flow in DSPs, Block diagrams, Typical layouts, Interfacing motor drives, Introduction to BMS and body control. **Mechatronic system design:** Design process-stages of design process – Traditional and Mechatronics design concepts – Case studies of Mechatronics systems – Pick and place Robot – Engine Management system – Automatic washing machine.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Additive Manufacturing	Additive Manufacturing
Course Code	171ME5E03	191ME6E12
Syllabus	**UNIT-I:** **Introduction:** Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process. Liquid Based – Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages, case studies. Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.	**UNIT-I:** **Introduction:** Basic principle, need, advantages, Challenges in Additive manufacturing (AM), AM Process chain - CAD Model - Input file formats - Generation and Conversion of STL file - File Verification and Repair - Build File Creation - Part Construction - Part Cleaning and finishing, Classification of additive manufacturing processes-Baseline approach, Raw material-based approach and ASTM classification, Materials used in additive manufacturing
	UNIT-II:. **Solid – Based Rapid Prototyping Systems:** Laminated object manufacturing (LOM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Fused deposition modeling (FDM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies.	**UNIT-II:** **VAT Photo Polymerization, Material Jetting and Binder Jetting AM technologies:** Stereo lithography Apparatus (SLA), Digital Light Projection (DLP), Solid Ground Curing (SGC), Nano Particle Jetting (NPJ), Binder Jetting and Multi Jet Fusion (MJF) processes - Working Principle, Materials, Applications, Advantages and Disadvantages
	UNIT-III: **Power Based Rapid Prototyping Systems:** Selective laser sintering (SLS): models and specifications, process, working principle, applications,	**UNIT-III:** **Material Extrusion and Sheet Lamination AM technologies:** Fused Deposition Modelling (FDM), Contour Crafting (CC), Laminated Object Manufacturing (LOM), –

	advantages and disadvantages, case studies. Three dimensional printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.	Working principle, Materials, Applications, Advantages and Disadvantages.
	UNIT-IV: **Rapid Tooling:** Introduction to rapid tooling (RT), conventional tooling vs RT, Need for RT. rapid tooling classification: indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, Ceramic tools, investment casting, spin casting, die casting, sand casting, 3D Keltool process. Direct rapid tooling: direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.	**UNIT-IV:** **Powder Bed Fusion and Direct Energy Deposition:** Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Electron Beam Melting (EBM), Laser Engineered Net Shaping (LENS), Wire Arc Additive Manufacturing (WAAM) - Working principle, Materials, Applications, Advantages and Disadvantages.
	UNIT-V: **Rapid Prototyping Data Formats:** STL file format, problems and repairs. Applications: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis, design and production of medical devices, forensic science and anthropology, visualization of bimolecular.	**UNIT-V:.** **Additive Manufacturing - Applications:** Applications in prototyping, concept models, visualization aids, replacement parts, tooling, jigs & fixtures, moulds, casting, and end-use parts, Industrial Applications in aerospace, automobile, medical, jewellery, sports, electronics, food, construction and architectural, Case studies.

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Department of Electronics and communication Engineering

Syllabus revision Index

2021-22

S.No	Name of the course	Percentage of syllabus change
1	Computer System Architecture	20
2	Integrated circuits and applications lab	25
3	VLSI Design	20
4	Information Theory and Coding	30
5	VLSI Lab	50

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Computer architecture and organization**	**Computer System Architecture**
Course Code	171EC5E01	191EC5E01
Syllabus	**UNIT I:** **Basic Structure of Computers:** Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance. **Computer Arithmetic:** Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating point Arithmetic operations, Decimal Arithmetic unit, Decimal Arithmetic operations.	UNIT-I **Basic Structure of Computers**: Basic Organization of Computers, Historical Perspective, Bus Structures, **Data Representation:** Data types, Complements, Fixed Point Representation. Floating – Point Representation. Other Binary Codes, Error Detection Codes. **Computer Arithmetic:** Addition and Subtraction, Multiplication Algorithms, Division Algorithms.
	UNIT II: **Register Transfer Language and Micro-Operations:** Register Transfer language. Register Transfer, Bus and memory Transfer, Types of Micro-operations, Arithmetic logic shift unit, Instruction codes, Computer Registers, Computer instructions, Instruction cycle, Memory Reference Instructions, Input Output and Interrupt.	UNIT-II Register Transfer Language and Microoperations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit. Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.
	UNIT III: **Central Processing Unit:** Stack organization, Instruction formats, Addressing modes, Data Transfer and manipulation, Program control, Reduced Instruction Set	**UNIT-III** **Central Processing Unit:** General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control,

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	Computer (RISC). **Micro Programmed Control:** Control memory, Address sequencing, Micro program example, Design of control unit-Hard wired control, Micro programmed control	Reduced Instruction Set Computer. **Microprogrammed Control:** Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.
	UNIT IV: **The Memory System:** Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory. **Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous data Transfer Modes, Priority Interrupt, Direct Memory Access (DMA), Input – Output Processor (IOP)	**UNIT-IV** **Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. **Input-Output Organization**: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.
	UNIT V: **Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors. **Multi Processors:** Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence.	**UNIT-V** **Multi Processors:** Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration. **Pipeline:** Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Integrated circuits and applications lab	Linear ic applications lab
Course Code	171EC5L04	191EC5L05
Syllabus	**List of Experiments:** 1. Explain about the Functioning, Parameters and Specifications of ICs-IC 741, IC 555, IC 565, IC 566, IC 1496. 2. Perform addition and Subtraction using inverting mode Op-Amp and design the Comparator circuit. 3. Construct and test the performance of an Integrator and Differentiator using IC 741. 4. Design and verify the operation of the Active low pass and high pass filters using IC 741 and plot its frequency response. 5. Verify the working of RC phase shift and Wien's bridge oscillator using IC 741 and draw output waveforms. 6. Design a Function Generator circuit to generate square wave and triangular wave using Op-Amp? 7. Design and verify the operation of Monostable Multivibrator using IC 555. 8. Verify the working of Astable Multivibrator using IC 555 timer. Find the duty cycle of output waveform?	List of Experiments: 1. Construct basic Applications of Op-Amp – Adder, Subtractor, Comparator Circuits. 2. Design of an Integrator and Differentiator Circuits using Op-Amp 741. 3. Construct Waveform Generator using single Op-Amp with variable duty cycle 4. Design Schmitt Trigger Circuits using Single OP-AMP with Reference voltage. 5. Design a Function Generator using Op-Amp for bandwidth up to 1MHz. 6. Design an Active Filters1 – LPF, HPF (first order) using Op-Amp 741. 7. Design an Active Filters2 – BPF, Band Reject (Wideband) and Notch Filters using Op- Amp 741. 8. Construct Monostable and Astable multivibrator using IC 555 Timer. 9. Evaluate Capture range and Lock range using PLL IC565.. 10. Design of Dual Power Supply using 78XX and 79XX and full wave Bridge Rectifier with shunt capacitance filters). Augmented on Experiments: (Any two of the following experiments can be performed) 11.Design a 4-bit R-2R Ladder network

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	9. Verify the operation of Schmitt trigger using Op-Amp IC 741 and IC 555. Draw the output waveforms and calculate hysteresis width? 10. Design a 4-bit R-2R Digital to Analog Converter using Op-Amp IC and Plot I/O curve. **List of Augmented Experiments: (Minimum of two experiments has to be performed)** 1. Construct Integrator and Differentiator using IC 741 and verify its operation using P-SPICE. 2. Simulate and verify the RC phase shift and Wien's bridge oscillators using P-SPICE and draw output waveforms. 3. Simulate and verify the Active low pass and high pass filters using P-SPICE. 4. Verify the characteristics of PLL using IC 565. 5. Compare the response of Voltage regulator using IC 723 and Three Terminal Voltage Regulators – 7805, 7809, 7912.	with Op-Amp Buffer and Measure the output waveform for various input combinations. 12. Construct Waveform Generator using 8038 for a fixed frequency and trace the output waveform. 13. Design and Construct ± 12V DC Power Supply using Three terminal Voltage Regulators 7812and7912. 14. Design of oscillator Circuits – Phase Shift and Wien Bridge Oscillators using single Op-Amp

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	VLSI Design	VLSI Design
Course Code	171EC6T14	191EC6T13
Syllabus	**UNIT I:** **Introduction:** Introduction to IC Technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, MOS and CMOS Fabrication processes, BiCMOS Technology, Comparison between CMOS and Bipolar technologies.	**UNIT I:** **Introduction:** Introduction to IC Technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, MOS and CMOS Fabrication processes, Bi-CMOS Technology, Comparison between CMOS and Bipolar technologies.
	UNIT II: **Basic Electrical Properties of MOS and Bi-CMOS Circuits:** Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistorTrans, Output Conductance and Figure of Merit. The Pass transistor, NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by anotherNMOS inverter. Alternative forms of pull-up, The CMOS Inverter, MOS transistor circuit model, Bi-CMOS Inverter, Latch-up in CMOS circuits and BiCMOS Latch-up Susceptibility.	**UNIT II:** **Basic Electrical Properties of MOS and Bi-CMOS Circuits:** Ids versus Vds Relationships, Aspects of MOS transistor: Threshold Voltage, MOS transistor Trans-conductance, Output Conductance and Figure of Merit. The Pass transistor, NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter. Alternative forms of pull-up, The CMOS Inverter, MOS transistor circuit model, Bi- CMOS Inverter, Latch-up in CMOS circuits and Bi-CMOS Latch-up Susceptibility. Transistor switches, Schematics of Inverter, NAND, NOR gates using NMOS, PMOS and CMOS technologies
	UNIT III: **MOS and Bi-CMOS Circuit Design Processes:**	**UNIT-III:** **MOS and Bi-CMOS Circuit Design Processes:** MOS Layers, Design Rules,

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	MOS Layers, Stick Diagrams, Design Rules and Layout, General observations of design rules, 2µm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2µmDouble Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form. **Basic Circuit Concepts:** Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays, Wiring Capacitances, Fan-in and fan-out characteristics, Choice of layers, Transistor switches, Realization of gates using NMOS, PMOS and CMOS technologies.	General observations of design rules, 2µm Double Metal, Double Poly, CMOS/Bi-CMOS rules, 1.2µmDouble Metal, Double Poly CMOS rules, Stick Diagrams, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.
	UNIT IV: **Scaling of MOS Circuits:** Scaling models, Scaling factors for device parameters, Limits due to sub threshold currents, current density limits on logic levels and supply voltage due to noise. **Subsystem Design:** Architectural issues, switch logic, Gate logic, examples of structured design, clocked sequential circuits, system considerations, general considerations of subsystem design processes,	**UNIT-IV:** **Basic Circuit Concepts & Scaling of MOS Circuits:** Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays, Wiring Capacitances, Fan-in and fan-out characteristics, Choice of layers. Scaling models, Scaling factors for device parameters, **Subsystem Design:** Architectural issues, switch logic, Gate logic, examples of structured design, clocked sequential circuits, system considerations, an illustration of design processes.
	UNIT V: **VLSI Design Issues:** VLSI Design issues and design trends, design process, design for testability, technology options, power calculations, package selection, clock	**UNIT-V:** VLSI Design Issues: VLSI Design issues and design trends, technology options, power calculations, package selection, clock mechanisms, mixed signal design, ASIC design flow, and

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	mechanisms, mixed signal design, ASIC design flow, and introduction to SoC design. **FPGA Design:** Basic FPGA architecture, FPGA configuration, configuration modes, FPGA designs process- FPGA design flow, FPGA families.	introduction to SoC design. Over view on DFT (qualitative treatment only) **FPGA Design:** Basic FPGA architecture, FPGA configuration, configuration modes, FPGA design process- FPGA design flow, FPGA families.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Information Theory and Coding	Information Theory and Coding
Course Code	171EC6E09	191EC6E07
Syllabus	**UNIT I:** **Information theory and source coding:** Uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding, Source with memory and its entropy.	**UNIT-I:** **Information theory, source coding and channel capacity:**Entropy, Mutual information, Conditional, and Joint Entropy. Measures for Continuous, Random variable, Relative Entropy. Variable-length codes, Prefix codes, Source coding theorem, various source coding techniques: Huffman, Arithmetic, Lempel Ziv, Run Length. Channel models and channel capacity, Noisy channel and coding theorem and its application to BSC, Shannon's theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth-S/N trade off, Fading channel, channels with memory, capacity of MIMO channels.
	UNIT II: **Discrete channels:** Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon's theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon's theorem, Fading channel, channels with memory.	**UNIT-II:** **Error Control Codes:**Introduction to Error Control Coding, Galois field, Generator matrix, Parity check matrix, systematic codes, error detection and corrections, standard array and syndrome decoding, Probability of error, coding gain, Hamming bound, Hamming codes, LDPC codes, and MDS codes.
	UNIT III: **Groups, fields and linear block codes:** Galois field and its construction in	UNIT-III: Cyclic codes and BCH codes: Introduction to Cyclic codes, Generator,

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	GF(2m) and its basic properties, vector spaces and matrices in GF(2), Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.	and parity check matrix of cyclic codes, syndrome computation, and error detection. Fire code, Golay code and CRC codes, Circuit implementation of cyclic codes, multiple error-correcting BCH codes, decoding of BCH codes, Reed-Solomon codes, error location, and correction.
	UNIT IV: **Cyclic codes and BCH codes:** Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, Encoding and Decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location and correction.	**UNIT-IV:** **Convolutional codes and Space-Time codes**: Introduction to convolution code, Trellis codes: Generator polynomial matrix and Encoding using Trellis, Viterbi algorithm for maximum likelihood decoding, Automatic repeat request (ARQ) strategies, Probability of error, throughput efficiency considerations, Turbo Codes, Introduction to Trellis Coded Modulation (TCM), TCM for fading channel, Space-Time Trellis Codes (STTC), Space-Time Block Codes (STBC).
	UNIT V: **Convolutional codes:** Introduction to convolution code, its construction and Viterbi algorithm for maximum likelihood decoding, Automatic repeat request strategies and their throughput efficiency considerations, Turbo Codes	**UNIT-V:** **Cryptography and Physical layer security:**Introduction to Cryptography: Symmetric key and Asymmetric Key Cryptography, Some well-known algorithms: DES, IDEA, PGP, DH Protocol, Introduction to Physical Layer Security: Notion of Secrecy Capacity, Secrecy Outage Capacity, Secrecy Outage Probability, Cooperative Jamming.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	VLSI Lab	VLSI Lab
Course Code	171EC6L08	191EC6L08
Syllabus	1. Digital circuit simulation 2. Digital circuits Schematics and its functional response verification of logic gates 3. Digital circuits Schematics and its functional response verification of complex logic gates and combinational circuits 4. Layout Extraction of Logic gates. 5. Layout Extraction of complex gates and combinational circuits 6. Performing DRC for logic gates 7. Performing DRC for complex gates and combinational circuits 8. Performing LVS / Net list extraction for logic gates 9. Performing LVS / Net list extraction for complex gates and combinational circuits 10. PEX estimation for the given logic circuits 11. PEX estimation for the given complex gates and combinational circuits **Augmented Experiments: (Minimum of two experiments has to be performed)** 1. Layout design for specific constraints (delay, power dissipation) 2. DRC / LVS / PEX verification of Multiplexer. 3. DRC / LVS / PEX verification of a	PART (A): Front-end design and Implementation Note 1: The students need to develop Verilog Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary Synthesizer. Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in the Laboratory 1. Realization of Logic gates 2. Design and Implementation Flip-Flops 3. Design and Implementation of full Adder in different styles. 4. Design and Implementation 3:8 decoder realization through 2:4 decoder 5. Design and Implementation 8-bit synchronous up-down counter PART (B): Back-end Level Design and Implementation Note: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using Industry standard EDA Tools. 1. An Inverter

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	given SOP(Z= (AB+C)D) '	2. Universal Gates 3. Full Adder List of Augmented Experiments: (Any two of the following experiments can be performed) 1. Design and Implementation of 16:1 mux through 4:1 mux 2. Design and Implementation of sequence detector 3. Layout design for SR latch

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Date: 31-08-2021

Department of Computer Science and Engineering

Syllabus revision Index 2021-2022

S.no	Course Name	Percentage change in Syllabus
1	Advanced Data Structures	50%
2	Operating Systems	55%
3	Software Engineering	25%
4	Web Technologies	50%
5	Software Testing Methodologies	60%
6	Image Processing	50%

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Department of Computer Science and Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Advanced Data Structures	Advanced Data Structures
Course Code	191CS3T03	201CS3T01
Syllabus	**UNIT-I:** Dictionaries and Hashing: Sets, Dictionaries, Hash Tables, Open Hashing, Closed Hashing (Rehashing Methods), Different Hash Functions(Division Method, Multiplication Method, Mid-Square Method, Folding Method), Secure Hash Functions, Collision Resolution Techniques - Open Addressing and Closed Addressing, Dynamic Hashing.	**UNIT-I:** External Sorting: Introduction, K-way Merge Sort, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs, Huffman Tree. Hashing: Introduction to Static Hashing, Hash Tables, Hash Functions, Different Hash Functions, Collision Resolution Techniques, Dynamic Hashing
	UNIT-II: Introduction to Non linear Data Structures: Trees: Introduction, Types of Trees, Creating a Binary tree, Traversing a Binary Tree, Applications of Binary Tree. Priority Queues: Introduction, Binary Heaps, Basic Heap Operations, Applications of Priority Queues.	**UNIT-II:** Priority Queues (Heaps): Introduction, Binary Heaps-Model and Simple Implementation, Basic Heap Operations, Other Heap Operations, Applications of Priority Queues, Binomial Heaps (or Queues), Binomial Heap Structure and Implementation, Binomial Queue Operations.
	UNIT-III: Efficient Binary Search Trees: Binary Search Trees, Operations on Binary Search Trees, Self- balancing Binary Search Trees, AVL Trees- Operations on AVL Trees Multi-way Search Trees: B-Trees, B+ Trees.	**UNIT-III:** Efficient Binary Search Trees: Self-balancing Binary Search Tree, AVL Trees, Rotations-LL, RR, LR and RL, Searching, Insertion, Deletion operations on AVL Trees, Red-Black Tree, Properties and Representation of Red-Black Trees, Insertion and deletion operations on Red-Black Trees, Applications of Red-Black Trees.
	UNIT-IV: Graphs: Graph Terminology, Representations of	**UNIT-IV:** Multiway Search Trees: M-Way Search Trees Definition and

	Graphs, Graph Traversal Algorithms, Minimum Cost Spanning Tree-Kruskal's and Prim's algorithms, Shortest Path Algorithm Dijkstr's Algorithm, Applications of Graphs.	Properties, B-Tree Definition and Properties, Searching, Insertion and Deletion operations on B-Trees, B+ Tree, Insertion and Deletion operations on B+ Trees. Digital Search Structures: Introduction to Digital Search Tree, Operations on Digital Search Trees-Insertion, Searching, and Deletion.
	UNIT-V: Pattern matching algorithms: The Boyer –Moore algorithm, The Knuth-Morris- Pratt algorithm Tries: Definition, Digital Search Tree-Operations on Digital Search Tree, Binary trie and Patricia. .	**UNIT**-V: Digital Search Structures: Binary Tries, Compressed Binary Trie, Patricia, Searching Patricia, inserting into Patricia, delete a node from Patricia, Multiway Tries- Definition, Searching a Trie, Compressed Tries, Compressed Tries with Digit Numbers-Searching, Insertion, Deletion. String Processing: String Operations, Brute-Force Pattern Matching, The BoyerMoore Algorithm, The Knuth-Morris-Pratt Algorithm, The Longest Common Subsequence Problem (LCS). .

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Department of Computer Science and Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Operating Systems	Operating Systems
Course Code	191CS5T11	201CS3T03
Syllabus	**UNIT-I:** Introduction to Operating System Concepts: What Operating System do, Operating System Structure, Operating System Operations, Process Management, Memory management, Storage Management, Protection and Security, Computing Environments, Open-Source Operating systems, Operating systems services, System call, Types of System call.	**UNIT-I:** Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems. System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, System Boot.
	UNIT-II: Process Management: Process Concept: The process, Process State, Process control block, Threads, Process Scheduling: Scheduling Queues, Schedulers, Context switch, Operations on Processes, Inter process Communication. Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms. Multithread Programming: Overview, Benefits, Multithreading Models.	**UNIT-II:** Process Concept: Process scheduling, Operations on processes, Inter-process communication. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.
	UNIT-III: Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors. Deadlocks: System Model, Deadlock Characterization, Methods for handling Deadlock, Deadlock Prevention, Deadlock Avoidance,	**UNIT-III:** Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Classical IPC Problems - Dining philosophers problem, Readers and writers problem. Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm,

	Deadlock Detection, Recovery from Deadlock.	Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.
	UNIT-IV: Memory Management: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table. Virtual Memory Management: Background, Demand Paging, Page Replacement, Thrashing.	**UNIT-IV:** Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation. Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation. File Systems: Files, Directories, File system implementation, management and optimization.
	UNIT-V: File System Interface: File concept, Access Methods, Directory and Disk structure, File system mounting, File sharing, protection. Implementing File-Systems: File system structure, File System implementation, Directory Implementation, allocation methods, free-space management. Mass-storage structure: Overview of Mass-storage structure, Disk scheduling. .	**UNIT**-V: Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation. System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats. Case Studies: Linux, Microsoft Windows. .

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Software Engineering	Software Engineering
Course Code	191CS3T01	201CS3T04
Syllabus	**UNIT-I:** Introduction to Software Engineering: Software, Software Crisis, Software Engineering Definition, Evolution of Software Engineering Methodologies, Software Engineering Challenges Software Process: Software Process, Process Classification, Phased Development Life Cycle, Software Development Process Models. Case Study: Survey on different process models including. i. Advantages and Disadvantages of the models. ii. Applicability of the model. iii. Projects developed using the various models.	**UNIT-I:** Introduction to Software Engineering: The Nature of Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. Software Process: Software Process, Process Classification, Phased Development Life Cycle, Software Development Process Models – Waterfall Model, Iterative Waterfall Model, Prototype Model, Incremental Model, Spiral Model, Agile Process Model and RUP process Model. Case Study: Survey on different process models including. i. Advantages and Disadvantages of the models. ii. Applicability of the model. iii. Projects developed using various models.
	UNIT-II: Software Project Management: Project Management Essentials, What is Project Management, Software Configuration Management, Risk management. Project Planning and Estimation: Project Planning Activities, Software Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques. Case Study: Estimate the effort of the software development using Functional Points for the real time problem.	**UNIT-II:** Software Project Management: Project Management Essentials, What is Project Management, Software Configuration Management, Risk management. Project Planning and Estimation: Project Planning Activities, Software Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques. Case Study: Estimate the effort of the software development using Functional Points and COCOMO Model for any one of the real time problem.

	UNIT-III: Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles, Modular Design, Software Architecture, Design Methodologies, Implementation: Coding Principles, Coding Process, Code Verification, Code Documentation. Case Study: Construct the HLD and LLD using SRS created	**UNIT-III:** Requirements Engineering: Software Requirements, Requirements Engineering Process, Requirements Elicitation and Analysis, Requirements Specification, Requirements Validation, Requirements Management. Case Study: Create a SRS document for any one of the following Software Projects. 1) Course Registration System 2) Students Marks Analyzing System 3) Online Ticket Reservation System 4) Stock Maintenance
	UNIT-IV: Requirements Engineering: Software Requirements, Requirements Engineering Process, Requirements Elicitation and Analysis, Requirements Specification, Requirements Validation, Requirements Management, Case Study: Create a SRS document for a real time scenario.	**UNIT-IV:** Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles, Modular Design, Software Architecture, Design Methodologies, Implementation: Coding Principles, Coding Process, CodeVerification, Code Documentation. Case Study: Construct the DFD and CFD for any one of the following Software Projects. 1) Airline Reservation System 2) Students Marks Analyzing System 3) ATM System 4) Library Management System
	UNIT-V: Software Testing: Testing Fundamentals, Test Planning, Black-Box Testing, White- Box Testing, Levels of Testing, Usability Testing, Regression Testing, Debugging Approaches. Software Quality and Reliability: Software Quality factors, Verification & Validation, Software Quality Assurance, The Capability Maturity Model, Software Reliability. Case Study: Write the test cases for the real time scenario considered using White Box & Black Box Testing Techniques. .	**UNIT**-V: Software Testing: Testing Fundamentals, Test Planning, Black-Box Testing, WhiteBox Testing, Levels of Testing, Usability Testing, Regression Testing, Debugging Approaches. Software Quality and Reliability: Software Quality factors, Verification & Validation, Software Quality Assurance, The Capability Maturity Model, Software Reliability. Case Study: Design the test cases for any one of the following real time scenarios using White Box & Black Box Testing Techniques. 1) E-Commerce application (Flipkart, Amazon) 2) Mobile Application

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Department of Computer Science and Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Web Technologies	Web Technologies
Course Code	171CS6T16	191CS6T14
Syllabus	**UNIT-I:** HTML: Introducing HTML Document Structure, Working with Links, Images, Tables and Frames. Introduction to Forms and HTML Controls, Cascading Style Sheets. The Basics of JavaScript: Primitives, Operations, and Expressions, Screen Output and Keyboard Input, Control Statements, Arrays, Functions, Pattern Matching using Regular Expressions, Events and Event Handling.	**UNIT-I:** HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, HTML styles, Elements, Attributes, Heading, Layouts, HTML Media, Iframes, Images, Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML. CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, Box Model, Conflict Resolution, CSS3.
	UNIT-II: XML: Document type Definitions, XML Schemas, XSLT Style Sheets, Document Object Model, DOM and SAX Approaches	**UNIT-II:** Javascript - Introduction, Primitives, Variables – var, let, const, Operations and Expressions, Control Statements, Functions, Objects (Predefined - String, Number, Array, Date, Math, Random, RegExp, User Defined – Definition, Properties, Methods, Display, Accessors, Constructors), Events, Pattern Matching using Regular Expressions, Working with XML: Document type Definition (DTD), XML schemas, XSLT, XML and CSS, Document object model, Parsers - DOM and SAX.
	UNIT-III: PHP Programming: Introducing PHP: Creating PHP script, Running PHP Script, Working with variables and constants: Using variables, Using constants, Data types, Operators, Controlling program flow: Conditional Statements, Looping	**UNIT-III:** Node.js- Introduction, Advantages, Process Model, Modules, HTTP Module, File system, URL module, NPM, Events, Upload Files, Email. Angular JS – Introduction, Expressions, Modules, Directives, Model, Data Binding, Controllers,

	Statements, Working with Arrays, functions, Files, Directories, Working with forms and Databases: Tag and Form Elements, using PHP and MySQL. AJAX: A New Approach, Integrating PHP and AJAX.	Scopes, Filters, Services, HTTP, Tables, Select, Events, Forms, Validation, API, W3.CSS, Includes, Routing, SQL, DOM, Application.
	UNIT-IV: PERL: A Brief History of Perl, Perl Variables, Arithmetic and String Operators, Conditional Statements, Perl I/O, Perl Iterations, functions, The Perl CGI Module, Pattern Matching in Perl, Simple Page Search.	**UNIT-IV:** React JS – Introduction, Displaying "Welcome React", Introducing JSX, Rendering Elements, Components and Props, State and Lifecycle, Handling Events, Conditional Rendering, Lists and Keys, Forms, Lifting State Up, Composition vs Inheritance, Thinking in React.
	UNIT-V: Introduction to Ruby: Scalar Types and Their Operations, Simple Input and Output, Control Statements, Fundamentals of Arrays, Hashes, Methods, Classes, Blocks and Iterators, Pattern Matching. .	**UNIT**-V: PHP Programming - Introduction, Creating and Running PHP Script. Variables, Constants, DataTypes, Operators. Controlling Program Flow - Conditional and Loop statements, Arrays, Functions, Client-Server Scripting – XAMPP/LAMP Introduction, Running PHP Script in XAMPP, Super Globals, Working with Form Data, Database Connectivity – MySQL Introduction using XAMPP in Command Mode and GUI, Working with MySQL Queries, Integrating PHP and MySQL to work with Form Data. No SQL Database - MongoDB Introduction, Create and Drop Database, Create and Drop Collection, Data Types, Insert, Query, Update, Delete, Integrating PHP with MongoDB.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Software Testing Methodologies	Software Testing Methodologies
Course Code	171CS5E04	191CS6E10
Syllabus	**UNIT-I:** Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, relate STLC to SDLC, Software Testing Methodology	**UNIT-I:** Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs. Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology. Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation.
	UNIT-II: Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify code, Validation. Dynamic Testing I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing.	**UNIT-II:** Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.
	UNIT-III: Dynamic Testing II: White-Box Testing: need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing. Static Testing: Inspections, Structured Walkthroughs, Technical reviews.	**UNIT-III:** Static Testing: Inspections, Structured Walkthroughs, Technical Reviews Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing. Regression testing: Progressives Vs. regressive testing, Regression test

		ability, Objectives of regression testing, Regression testing types, Regression testing techniques.
	UNIT-IV: Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing. Regression testing: Progressives Vs regressive testing, Regression testability, Objectives of regression testing, When regression testing done?, Regression testing types, Regression testing techniques.	**UNIT-IV:** Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQ Amodels. Debugging: process, techniques, correcting bugs.
	UNIT-V: Software Testing Tools: Introduction to Testing, need for Automated Testing, Taxonomy of Testing tools, Regression and performance Testing tools, Testing management tools, Source code testing tools, How to select a testing tool. Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner, Using Win runner, Mapping the GUI, Recording Test, working with Test, Enhancing Test, Checkpoints, Test Script Language, putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.	**UNIT**-V: Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit. Test Automation using Selenium tool. .

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Aditya Nagar, ADB Road, Surampalem - 533437, Near Kakinada, E.G.Dt., Ph:99498 76662

Department of Computer Science and Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Image Processing	Image Processing
Course Code	171CS7E15	191CS6E07
Syllabus	**UNIT-I:** Introduction: Digital Image Processing, Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels	**UNIT-I:** Introduction: Fundamentals Steps in Digital Image Processing, Components of an image processing system, Elements of Visual Perception ,Image Sensing and Acquisition ,Image Sampling and Quantization ,Relationships between pixels Color Image processing: Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.
	UNIT-II: Digital Image Properties: Metric and topological properties of Digital Images, Histogram, entropy, Visual Perception, Image Quality, Color perceived by humans, Color Spaces, Palette Images, color Constancy Color Images: Pixel brightness transformations, Local Preprocessing, image smoothing, Edge detectors, Robert Operators, Laplace, Prewitt, Sobel, Fri-chen, Canny Edge detection, Smoothing Spatial Filters, Sharpening Spatial Filters	**UNIT-II:** Image Enhancement: Spatial Domain: Gray level transformations , Histogram processing , Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform, Smoothing and Sharpening frequency domain filters ,Ideal, Butterworth and Gaussian high pass filters, Homomorphic filtering. UNIT-III: Image Restoration: Image Restoration ,degradation model, Noise models, Mean Filters ,Order Statistic filters, Adaptive filters , Band reject Filters, Band pass Filters, Notch Filters ,Optimum Notch Filtering ,Inverse Filtering ,Wiener filtering.
	UNIT-III: Mathematical Morphology: Basic Mathematical Concepts, Binary dilation and Erosion, Opening and closing, Gray Scale	**UNIT-III:** Image Restoration: Image Restoration ,degradation model, Noise models, Mean Filters ,Order Statistic filters, Adaptive filters , Band reject

	dilation and erosion, Skeleton, Thinning , Thickening Ultimate erosion, Geodesic transformations, Morphology and reconstruction, Morphological Segmentation	Filters, Band pass Filters, Notch Filters ,Optimum Notch Filtering ,Inverse Filtering ,Wiener filtering.
	UNIT-IV: Segmentation: Threshold detection methods, Optimal Thresholding, Edge based Segmentation-Edge image thresholding, Edge relaxation, Border tracing, Hough Transforms, Region based segmentation: Region Merging Region Splitting, Splitting and Merging, Watershed Segmentation.	**UNIT-IV:** Image Segmentation: Edge detection, Edge linking via Hough transform, Thresholding ,Region based segmentation: Region growing, Region splitting and merging, Morphological processing: Erosion and dilation, Segmentation by morphological watersheds :basic concepts , Dam construction ,Watershed segmentation algorithm
	UNIT-V: Image Data Compression: Image data Properties, Discrete Image Transformations in data compression, Discrete Cosine and Wavelet Transforms, Types of DWT and merits; Predicative Compression methods, Hierarchical and Progressive Compression methods, Comparison of Compression methods, JPEG- MPEG Image Compression methods.	**UNIT-V:** Image Compression and Recognition: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors, Topological feature, Texture, Patterns and Pattern classes ,Recognition based on matching.

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Department of Information Technology

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Advanced Data Structures	Advanced Data Structures
Course Code	191CS3T03	201CS3T01
Syllabus	**UNIT-I:** Dictionaries and Hashing: Sets, Dictionaries, Hash Tables, Open Hashing, Closed Hashing (Rehashing Methods), Different Hash Functions(Division Method, Multiplication Method, Mid-Square Method, Folding Method), Secure Hash Functions, Collision Resolution Techniques - Open Addressing and Closed Addressing, Dynamic Hashing.	**UNIT-I:** External Sorting: Introduction, K-way Merge Sort, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs, Huffman Tree. Hashing: Introduction to Static Hashing, Hash Tables, Hash Functions, Different Hash Functions, Collision Resolution Techniques, Dynamic Hashing
	UNIT-II: Introduction to Non linear Data Structures: Trees: Introduction, Types of Trees, Creating a Binary tree, Traversing a Binary Tree, Applications of Binary Tree. Priority Queues: Introduction, Binary Heaps, Basic Heap Operations, Applications of Priority Queues.	**UNIT-II:** Priority Queues (Heaps): Introduction, Binary Heaps-Model and Simple Implementation, Basic Heap Operations, Other Heap Operations, Applications of Priority Queues, Binomial Heaps (or Queues), Binomial Heap Structure and Implementation, Binomial Queue Operations.
	UNIT-III: Efficient Binary Search Trees: Binary Search Trees, Operations on Binary Search Trees, Self- balancing Binary Search Trees, AVL Trees- Operations on AVL Trees Multi-way Search Trees: B-Trees, B+ Trees.	**UNIT-III:** Efficient Binary Search Trees: Self-balancing Binary Search Tree, AVL Trees, Rotations-LL, RR, LR and RL, Searching, Insertion, Deletion operations on AVL Trees, Red-Black Tree, Properties and Representation of Red-Black Trees, Insertion and deletion operations on Red-Black Trees, Applications of Red-Black Trees.
	UNIT-IV: Graphs: Graph Terminology, Representations of	**UNIT-IV:** Multiway Search Trees: M-Way Search Trees Definition and

	Graphs, Graph Traversal Algorithms, Minimum Cost Spanning Tree-Kruskal's and Prim's algorithms, Shortest Path Algorithm Dijkstr's Algorithm, Applications of Graphs.	Properties, B-Tree Definition and Properties, Searching, Insertion and Deletion operations on B-Trees, B+ Tree, Insertion and Deletion operations on B+ Trees. Digital Search Structures: Introduction to Digital Search Tree, Operations on Digital Search Trees-Insertion, Searching, and Deletion.
	UNIT-V: Pattern matching algorithms: The Boyer –Moore algorithm, The Knuth-Morris- Pratt algorithm Tries: Definition, Digital Search Tree-Operations on Digital Search Tree, Binary trie and Patricia. .	**UNIT-V:** Digital Search Structures: Binary Tries, Compressed Binary Trie, Patricia, Searching Patricia, inserting into Patricia, delete a node from Patricia, Multiway Tries- Definition, Searching a Trie, Compressed Tries, Compressed Tries with Digit Numbers-Searching, Insertion, Deletion. String Processing: String Operations, Brute-Force Pattern Matching, The BoyerMoore Algorithm, The Knuth-Morris-Pratt Algorithm, The Longest Common Subsequence Problem (LCS). .

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Department of Information Technology

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Operating Systems	Operating Systems
Course Code	191CS5T11	201CS3T03
Syllabus	**UNIT-I:** Introduction to Operating System Concepts: What Operating System do, Operating System Structure, Operating System Operations, Process Management, Memory management, Storage Management, Protection and Security, Computing Environments, Open-Source Operating systems, Operating systems services, System call, Types of System call.	**UNIT-I:** Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems. System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, System Boot.
	UNIT-II: Process Management: Process Concept: The process, Process State, Process control block, Threads, Process Scheduling: Scheduling Queues, Schedulers, Context switch, Operations on Processes, Inter process Communication. Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms. Multithread Programming: Overview, Benefits, Multithreading Models.	**UNIT-II:** Process Concept: Process scheduling, Operations on processes, Inter-process communication. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.
	UNIT-III: Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors. Deadlocks: System Model, Deadlock Characterization, Methods for handling Deadlock, Deadlock Prevention, Deadlock Avoidance,	**UNIT-III:** Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Classical IPC Problems - Dining philosophers problem, Readers and writers problem. Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm,

	Deadlock Detection, Recovery from Deadlock.	Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.
	UNIT-IV: Memory Management: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table. Virtual Memory Management: Background, Demand Paging, Page Replacement, Thrashing.	**UNIT-IV:** Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation. Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation. File Systems: Files, Directories, File system implementation, management and optimization.
	UNIT-V: File System Interface: File concept, Access Methods, Directory and Disk structure, File system mounting, File sharing, protection. Implementing File-Systems: File system structure, File System implementation, Directory Implementation, allocation methods, free-space management. Mass-storage structure: Overview of Mass-storage structure, Disk scheduling. .	**UNIT-V:** Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation. System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats. Case Studies: Linux, Microsoft Windows. .

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Software Engineering	Software Engineering
Course Code	191CS3T01	201CS3T04
Syllabus	**UNIT-I:** Introduction to Software Engineering: Software, Software Crisis, Software Engineering Definition, Evolution of Software Engineering Methodologies, Software Engineering Challenges Software Process: Software Process, Process Classification, Phased Development Life Cycle, Software Development Process Models. Case Study: Survey on different process models including. i. Advantages and Disadvantages of the models. ii. Applicability of the model. iii. Projects developed using the various models.	**UNIT-I:** Introduction to Software Engineering: The Nature of Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. Software Process: Software Process, Process Classification, Phased Development Life Cycle, Software Development Process Models – Waterfall Model, Iterative Waterfall Model, Prototype Model, Incremental Model, Spiral Model, Agile Process Model and RUP process Model. Case Study: Survey on different process models including. i. Advantages and Disadvantages of the models. ii. Applicability of the model. iii. Projects developed using various models.
	UNIT-II: Software Project Management: Project Management Essentials, What is Project Management, Software Configuration Management, Risk management. Project Planning and Estimation: Project Planning Activities, Software Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques. Case Study: Estimate the effort of the software development using Functional Points for the real time problem.	**UNIT-II:** Software Project Management: Project Management Essentials, What is Project Management, Software Configuration Management, Risk management. Project Planning and Estimation: Project Planning Activities, Software Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques. Case Study: Estimate the effort of the software development using Functional Points and COCOMO Model for any one of the real time problem.

	UNIT-III: Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles, Modular Design, Software Architecture, Design Methodologies, Implementation: Coding Principles, Coding Process, Code Verification, Code Documentation. Case Study: Construct the HLD and LLD using SRS created	**UNIT-III:** Requirements Engineering: Software Requirements, Requirements Engineering Process, Requirements Elicitation and Analysis, Requirements Specification, Requirements Validation, Requirements Management. Case Study: Create a SRS document for any one of the following Software Projects. 1) Course Registration System 2) Students Marks Analyzing System 3) Online Ticket Reservation System 4) Stock Maintenance
	UNIT-IV: Requirements Engineering: Software Requirements, Requirements Engineering Process, Requirements Elicitation and Analysis, Requirements Specification, Requirements Validation, Requirements Management, Case Study: Create a SRS document for a real time scenario.	**UNIT-IV:** Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles, Modular Design, Software Architecture, Design Methodologies, Implementation: Coding Principles, Coding Process, CodeVerification, Code Documentation. Case Study: Construct the DFD and CFD for any one of the following Software Projects. 1) Airline Reservation System 2) Students Marks Analyzing System 3) ATM System 4) Library Management System
	UNIT-V: Software Testing: Testing Fundamentals, Test Planning, Black-Box Testing, White- Box Testing, Levels of Testing, Usability Testing, Regression Testing, Debugging Approaches. Software Quality and Reliability: Software Quality factors, Verification & Validation, Software Quality Assurance, The Capability Maturity Model, Software Reliability. Case Study: Write the test cases for the real time scenario considered using White Box & Black Box Testing Techniques. .	**UNIT-V**: Software Testing: Testing Fundamentals, Test Planning, Black-Box Testing, WhiteBox Testing, Levels of Testing, Usability Testing, Regression Testing, Debugging Approaches. Software Quality and Reliability: Software Quality factors, Verification & Validation, Software Quality Assurance, The Capability Maturity Model, Software Reliability. Case Study: Design the test cases for any one of the following real time scenarios using White Box & Black Box Testing Techniques. 1) E-Commerce application (Flipkart, Amazon) 2) Mobile Application

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Web Technologies	Web Technologies
Course Code	171CS6T16	191CS6T14
Syllabus	**UNIT-I:** HTML: Introducing HTML Document Structure, Working with Links, Images, Tables and Frames. Introduction to Forms and HTML Controls, Cascading Style Sheets. The Basics of JavaScript: Primitives, Operations, and Expressions, Screen Output and Keyboard Input, Control Statements, Arrays, Functions, Pattern Matching using Regular Expressions, Events and Event Handling.	**UNIT-I:** HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, HTML styles, Elements, Attributes, Heading, Layouts, HTML Media, Iframes, Images, Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML. CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, Box Model, Conflict Resolution, CSS3.
	UNIT-II: XML: Document type Definitions, XML Schemas, XSLT Style Sheets, Document Object Model, DOM and SAX Approaches	**UNIT-II:** Javascript - Introduction, Primitives, Variables – var, let, const, Operations and Expressions, Control Statements, Functions, Objects (Predefined - String, Number, Array, Date, Math, Random, RegExp, User Defined – Definition, Properties, Methods, Display, Accessors, Constructors), Events, Pattern Matching using Regular Expressions, Working with XML: Document type Definition (DTD), XML schemas, XSLT, XML and CSS, Document object model, Parsers - DOM and SAX.
	UNIT-III: PHP Programming: Introducing PHP: Creating PHP script, Running PHP Script, Working with variables and constants: Using variables, Using constants, Data types, Operators, Controlling program flow: Conditional Statements, Looping	**UNIT-III:** Node.js- Introduction, Advantages, Process Model, Modules, HTTP Module, File system, URL module, NPM, Events, Upload Files, Email. Angular JS – Introduction, Expressions, Modules, Directives, Model, Data Binding, Controllers,

	Statements, Working with Arrays, functions, Files, Directories, Working with forms and Databases: Tag and Form Elements, using PHP and MySQL. AJAX: A New Approach, Integrating PHP and AJAX.	Scopes, Filters, Services, HTTP, Tables, Select, Events, Forms, Validation, API, W3.CSS, Includes, Routing, SQL, DOM, Application.
	UNIT-IV: PERL: A Brief History of Perl, Perl Variables, Arithmetic and String Operators, Conditional Statements, Perl I/O, Perl Iterations, functions, The Perl CGI Module, Pattern Matching in Perl, Simple Page Search.	**UNIT-IV:** React JS – Introduction, Displaying "Welcome React", Introducing JSX, Rendering Elements, Components and Props, State and Lifecycle, Handling Events, Conditional Rendering, Lists and Keys, Forms, Lifting State Up, Composition vs Inheritance, Thinking in React.
	UNIT-V: Introduction to Ruby: Scalar Types and Their Operations, Simple Input and Output, Control Statements, Fundamentals of Arrays, Hashes, Methods, Classes, Blocks and Iterators, Pattern Matching. .	**UNIT-V:** PHP Programming - Introduction, Creating and Running PHP Script. Variables, Constants, DataTypes, Operators. Controlling Program Flow - Conditional and Loop statements, Arrays, Functions, Client-Server Scripting – XAMPP/LAMP Introduction, Running PHP Script in XAMPP, Super Globals, Working with Form Data, Database Connectivity – MySQL Introduction using XAMPP in Command Mode and GUI, Working with MySQL Queries, Integrating PHP and MySQL to work with Form Data. No SQL Database - MongoDB Introduction, Create and Drop Database, Create and Drop Collection, Data Types, Insert, Query, Update, Delete, Integrating PHP with MongoDB.

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Department of Information Technology

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Software Testing Methodologies	Software Testing Methodologies
Course Code	171CS5E04	191CS6E10 .
Syllabus	**UNIT-I:** Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, relate STLC to SDLC, Software Testing Methodology	**UNIT-I:** Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs. Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology. Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation.
	UNIT-II: Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify code, Validation. Dynamic Testing I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing.	**UNIT-II:** Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.
	UNIT-III: Dynamic Testing II: White-Box Testing: need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing. Static Testing: Inspections, Structured Walkthroughs, Technical reviews.	**UNIT-III:** Static Testing: Inspections, Structured Walkthroughs, Technical Reviews Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing. Regression testing: Progressives Vs. regressive testing, Regression test

		ability, Objectives of regression testing, Regression testing types, Regression testing techniques.
	UNIT-IV: Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing. Regression testing: Progressives Vs regressive testing, Regression testability, Objectives of regression testing, When regression testing done?, Regression testing types, Regression testing techniques.	**UNIT-IV:** Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite. Software Quality Management: Software Quality metrics, SQ Amodels. Debugging: process, techniques, correcting bugs.
	UNIT-V: Software Testing Tools: Introduction to Testing, need for Automated Testing, Taxonomy of Testing tools, Regression and performance Testing tools, Testing management tools, Source code testing tools, How to select a testing tool. Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner, Using Win runner, Mapping the GUI, Recording Test, working with Test, Enhancing Test, Checkpoints, Test Script Language, putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.	**UNIT-V:** Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit. Test Automation using Selenium tool. .

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Department of Information Technology

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Image Processing	Image Processing
Course Code	171CS7E15	191CS6E07
Syllabus	**UNIT-I:** Introduction: Digital Image Processing, Examples of fields that use digital image processing, fundamental steps in digital image processing, components of image processing system. Digital Image Fundamentals: A simple image formation model, image sampling and quantization, basic relationships between pixels	**UNIT-I:** Introduction: Fundamentals Steps in Digital Image Processing, Components of an image processing system, Elements of Visual Perception ,Image Sensing and Acquisition ,Image Sampling and Quantization ,Relationships between pixels Color Image processing: Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.
	UNIT-II: Digital Image Properties: Metric and topological properties of Digital Images, Histogram, entropy, Visual Perception, Image Quality, Color perceived by humans, Color Spaces, Palette Images, color Constancy Color Images: Pixel brightness transformations, Local Preprocessing, image smoothing, Edge detectors, Robert Operators, Laplace, Prewitt, Sobel, Fri-chen, Canny Edge detection, Smoothing Spatial Filters, Sharpening Spatial Filters	**UNIT-II:** Image Enhancement: Spatial Domain: Gray level transformations , Histogram processing , Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform, Smoothing and Sharpening frequency domain filters ,Ideal, Butterworth and Gaussian high pass filters, Homomorphic filtering. UNIT-III: Image Restoration: Image Restoration ,degradation model, Noise models, Mean Filters ,Order Statistic filters, Adaptive filters , Band reject Filters, Band pass Filters, Notch Filters ,Optimum Notch Filtering ,Inverse Filtering ,Wiener filtering.
	UNIT-III: Mathematical Morphology: Basic Mathematical Concepts, Binary dilation and Erosion, Opening and closing, Gray Scale	**UNIT-III:** Image Restoration: Image Restoration ,degradation model, Noise models, Mean Filters ,Order Statistic filters, Adaptive filters , Band reject

	dilation and erosion, Skeleton, Thinning , Thickening Ultimate erosion, Geodesic transformations, Morphology and reconstruction, Morphological Segmentation	Filters, Band pass Filters, Notch Filters ,Optimum Notch Filtering ,Inverse Filtering ,Wiener filtering.
	UNIT-IV: Segmentation: Threshold detection methods, Optimal Thresholding, Edge based Segmentation-Edge image thresholding, Edge relaxation, Border tracing, Hough Transforms, Region based segmentation: Region Merging Region Splitting, Splitting and Merging, Watershed Segmentation.	**UNIT-IV:** Image Segmentation: Edge detection, Edge linking via Hough transform, Thresholding ,Region based segmentation: Region growing, Region splitting and merging, Morphological processing: Erosion and dilation, Segmentation by morphological watersheds :basic concepts , Dam construction ,Watershed segmentation algorithm
	UNIT-V: Image Data Compression: Image data Properties, Discrete Image Transformations in data compression, Discrete Cosine and Wavelet Transforms, Types of DWT and merits; Predicative Compression methods, Hierarchical and Progressive Compression methods, Comparison of Compression methods, JPEG- MPEG Image Compression methods.	**UNIT-V:** Image Compression and Recognition: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors, Topological feature, Texture, Patterns and Pattern classes ,Recognition based on matching.

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Department of Petroleum Technology

Syllabus revision Index 2021-2022

S.No	Name of the course	Percentage of syllabus change
1	Fundamentals of Liquefied Natural gas	20
2	Well Logging and Mud Logging	38
3	Instrumentation and Process Control	40

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Department of Petroleum Technology

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	FUNDAMENTALS OF LIQUEFIED NATURAL GAS	FUNDAMENTALS OF LIQUEFIED NATURAL GAS
Course Code	171PT5E02	191PT6E04
Syllabus	UNIT – V Major equipment in LNG industry – Cryogenic heat exchangers: Spiral – Wound heat exchangers – Plate &fin heat exchangers – Cold boxes; Centrifugal compressors – Axial compressors – Reciprocating compressors; LNG pumps and liquid expanders – Loading Arms and gas turbines. Vaporizers: Submerged combustion vaporizers- Open rack vaporizers–Shell and tubevaporizers: direct heating withseawater, andindirect heating with seawater. Ambient air vaporizers: Direct heating with ambient air – Indirect heating with ambient air. LNG tanks. Safety, Security and Environmental Issues: Safety design of LNG facilities – Security issues for the LNG industry – Environmental issues – Risk-based analysis of an LNG plant.	UNIT – V Major equipment in LNG industry – Cryogenic heat exchangers: Spiral – Wound heat exchangers – Plate &fin heat exchangers – Cold boxes; Centrifugal compressors – Axial compressors – Reciprocating compressors; LNG pumps and liquid expanders – Loading Arms and gas turbines. Regasification of LNG: Description of Regasification, Vaporizers: Submerged combustion vaporizers- Open rack vaporizers–Shell and tube vaporizers: direct heating with seawater, and indirect heating with seawater. Ambient air vaporizers: Direct heating with ambient air – Indirect heating with ambient air. LNG tanks. Safety, Security and Environmental Issues: Safety design of LNG facilities – Security issues for the LNG industry – Environmental issues – Risk-based analysis of an LNG plant.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	WELL LOGGING AND FORMATION EVALUATION	WELL LOGGING AND MUD LOGGING
Course Code	171PT5T09	191PT5T09
Syllabus	. UNIT-I Direct Methods of Formation Evaluation and Concepts of well logging: Mud logging- coring – conventional and sidewall coring - Core analysis. What is well logging? – Logging terminology-Borehole environment-Borehole temperature and pressure-Log header and depth scale-Major components of well logging unit and logging setup- Classification of well logging methods-Log presentation- Log quality control	UNIT-I: Mud Logging Basics: Equipment, Services and Personnel, The Mud Log, Mud Logging Operations, Drill' Cuttings Analysis, Gas Extraction and Monitoring, Show Evaluation, Conventional Coring, Sidewall Coring, Sidewall coring, Core orientation, Core Handling, Core alteration and preservation, Problems in interpreting drill cuttings.
	UNIT-II Open hole Logging and Electrical Log Open hole logging: SP Logging- Origin of SP, uses of SP log-Calculation of salinity of formation water- Shaliness-Factors influence SP log. Resistivity log: Single point resistance log (SPR)- Conventional resistivity logs-Response of potential and gradient logs over thin and thick conductive and resistive formations-Limitations of conventional resistivity tools. Caliper log: Principle and application of caliper tool. Micro resistivity log: Conventional and focused micro resistivity logs and their application. Induction log: Principle of induction tool and the advantages, Determination of true resistivity (Rt) of the formation-Resistivity index-Archie's equation.	UNIT-II: Mud Logging Applications: Beginning of an oil kick, Detection of Water kick, Use of chromatograph to detect abnormal pressures in under compacted series, Circulation out a gas kick, Drilling through an evaporitic series, Drilling through a Sandstone series with salt-cemented sand layers.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	PROCESS DYNAMICS AND CONTROL	INSTRUMENTATION AND PROCESS CONTROL
Course Code	171PT5T06	191PT5T08
Syllabus	Fundamentals: Elements of instruments, static and dynamic characteristics-Basic concepts of response of first-order type instruments. Industrial Thermometers-1: Mercury in glass thermometer-Bimetallic Thermometer-Pressure spring thermometer, Static accuracy and response of thermometry.	Fundamentals: Elements of instruments, Functions of instruments and Characteristics of an instruments. Industrial Thermometers: Expansion thermometers and its types, Static accuracy and response of thermometry. Thermoelectricity-Industrial Thermocouples-Thermocouple wires-Thermocouple wells and response of thermocouples; Thermal coefficient of resistance-Industrial resistance-thermometer bulbs and circuits-Radiation receiving elements-Radiation pyrometers-photoelectric and optical pyrometers.
	UNIT-II Industrial Thermometers-2: Thermoelectricity-Industrial Thermocouples-Thermocouple wires-Thermocouple wells and response of thermocouples; Thermal coefficient of resistance-Industrial resistance-thermometer bulbs and circuits-Radiation receiving elements-Radiation photoelectric and optical pyrometers.	UNIT-II Pressure and vacuum: Liquid column manometers-Measuring elements for gauge pressure and vacuum-indicating elements for pressure gauges-Static accuracy and response of pressure gauges. Composition analysis: Spectroscopic analysis by absorption, emission and mass, Gas analysis by thermal conductivity, analysis of moisture.
	UNIT-III Composition analysis: Spectroscopic analysis by absorption, emission, mass and color measurement spectrometers-Gas analysis by thermal conductivity, analysis of moisture. Pressure, vacuum and head: Liquid column manometers-Measuring elements for gauge pressure and vacuum-indicating elements for pressure gauges-Measurement of absolute pressure-Measuring pressure in corrosive liquids-Static accuracy and response of pressure gauges.	UNIT-III Flow Meters: Head flow meters-Area flow meters-Viscosity measurements. Process Instrumentation: Controls center-Instrumentation diagram-Process analysis-Digital instrumentation and SCADA systems
	UNIT-IV Density and specific gravity measurements- Direct measurement of liquid level-Pressure measurement in open vessels-Level measurements in pressure vessels-Measurement of interface level-Density measurement and level of dry materials.	UNIT-IV Introduction to process dynamics and control: Response of first order systems – Physical examples of first order systems. Response of first order systems in series, higher order systems: Second order and transportation lag.
	UNIT-V Flow Meters: Head flow meters-Area flow meters-Open channel meters-Viscosity meters-Quantity	UNIT-V: Control systems, controllers and final control elements, Block diagram of a Petrochemical rector

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	meters-Flow of dry materials-Viscosity measurements. Recording instruments-Indicating and signaling instruments-Transmission of instrument readings-Controls center-Instrumentation diagram-Process analysis-Digital instrumentation, SCADA systems.	control system. Closed loop transfer functions, Transient response of simple control systems. Stability Criterion, Routh Test, Frequency control model, Controller tuning and process identification, Control valves.

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Department of Agricultural Engineering
Syllabus revision Index 2021-22

S.No	Name of the course	Percentage of syllabus change
1.	Thermodynamics, Refrigeration and Air Conditioning	20
2.	Tractor Systems and Controls	30
3.	Tractor Systems and Controls Lab	40
4.	Theory and Design of Agricultural Machinery	30
5.	Agricultural Process Engineering and Food Quality	20
6.	Engineering Properties of Biological Materials	20
7.	Agricultural Machinery and Equipment	40
8.	Agricultural Machinery and Equipment Lab	30

Department of Agricultural Engineering

1.1.2. Table-Prior/Post revision of syllabus

S.No.	Regulation	Pre-Revision	Post-Revision
	Course Title	Thermodynamics and Refrigeration System	Thermodynamics, Refrigeration and Air Conditioning
1	Course Code	191AG4T04	201AG3L03
	Syllabus	**UNIT-I:** **Introduction:** Introduction to thermodynamic system, boundary, surroundings, Classification of Thermodynamic system- closed, open and isolated system, Laws of conservation of energy, Definition of thermodynamic work and example of work, Thermodynamic properties, Laws of thermodynamic – first law, second law and Zeroth law, Gas laws-Boyles' law Charles Law and Gay Lussac's Law. Thermodynamic properties of perfect gases. Application of first law in heating and expansion of gases, Cycles-introduction-Applications, Carnot theorem-Carnot cycle, Entropy: Physical concept of entropy, Change of entropy of gases in thermodynamics.	**Unit –I:** Introduction: Basic concepts of thermodynamics: Thermodynamic System & Its Properties; Closed system-open system-isolated system, Gas laws- Boyles' law, Charles Law, Gay Lussac's Law, Laws of ideal gases- compression and expansion of gases; Laws of thermodynamic – First Law of Thermodynamics & Non Flow Processes- Non-Flow and Flow Processes, Second law of thermodynamics- Second Law, Entropy, Carnot Cycle, Entropy and Availability, General expression for Change in Entropy
		UNIT-II Engines: Classification, Components, working principles-Working cycle of 4-stoke and 2-stroke diesel and Petrol Engines, Comparison between 4 stroke and 2-stroke Diesel and Petrol Engines. **Power Cycle:** Otto, Diesel, Dual Combustion cycles – Description and representationon P–V and T-S Diagram, Air standard cycle efficiencies, Thermal Efficiency Heat engines, mean effective pressure, Measurement of indicated horse power, brake horse power, Heat balance calculations, Problems on IP, BP, Engine efficiencies and performances.	**UNIT-II** **Engines:** Classification, Components, working principles- Working cycle of 4-stoke and 2-stroke diesel and Petrol Engines, Comparison between 4 stroke and 2-stroke Diesel andPetrol Engines. **Power Cycle:** Otto, Diesel, Dual Combustion cycles – Description and representation onP–V and T-S Diagram, Air standard cycle efficiencies, Thermal Efficiency Heat engines, mean effective pressure, Measurement of indicated horse power, brake horse power, Heat balance calculations, Problems on IP, BP, Engine efficiencies and performances

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		UNIT-III **Principles of Refrigeration**: Definition of refrigeration, unit of refrigerating capacity, coefficient of performance, problems on refrigeration capacity Principles of refrigeration – Room air conditioner, domestic refrigerator, working substances in refrigeration machines, Production low temperatures- Expansion of a liquid with flashing, reversible adiabatic expansion of a gas, irreversible adiabatic expansion (throttling) of a real gas, thermoelectric cooling, adiabatic demagnetization. **Air Refrigeration System:** Working - Problems on reverse Carnot cycle, limitations of reversed Carnot cycle. Air refrigerators working on Bell Coleman cycle and Problems on Bell Coleman cycle.	**UNIT-III** **Principles of Refrigeration:** Units, Terminology; Refrigerating machine-the second lawinterpretation, heat engine vs heat pump vs refrigerating machine, Energy ratios or Coefficient of performance, Power consumption of a refrigerating machine, Refrigeration cycles- The Carnot principle, Reversed Carnot cycle and Bell Coleman cycle, Vapour & Gas as refrigerant in reversed Carnot cycle, Numerical problems; Production low temperatures- Expansion of a liquid with flashing, reversible adiabatic expansion of a gas, irreversible adiabatic expansion (throttling) of a real gas, thermoelectric cooling, adiabatic demagnetization.
		UNIT – IV **Vapor refrigeration** – Vapor as a refrigerant in reversed Carnot cycle with P-V and T-s diagrams, problems on reversed Carnot cycle with vapor, **Vapor Compression Systems:** Modifications in reverse Carnot cycle with vapor as refrigerant (dry vs. wet compression, throttling Vs isentropic expansion), Vapor compression cycle and component, vapor compression system calculations, P-h diagram - enthalpy diagram, super heating, sub cooling, effect of suction vapor super heating, sub cooling, problems on vapor compression cycle, Liquid-vapor regenerative heat exchanger for vapor compression system,	**UNIT – IV** **Vapour Compression Systems:** Modifications in reverse Carnot cycle with vapor as refrigerant (dry vs. wet compression, throttling vs isentropic expansion), Vapor compression cycle and component, vapor compression system calculations, P-h diagram - enthalpy diagram, super heating, sub cooling, effect of suction vapor super heating, subcooling, problems on vapor compression cycle, Liquid-vapor regenerative heat exchanger for vapor compression system. **Vapor-Absorption Refrigeration System:** Working principle, component, Maximum coefficient of performance of a heat operated refrigerating machine; common refrigerant- absorbent systems. Common refrigerants and their properties- Definition of refrigerant, Classification of refrigerants, Designations of refrigerants, Properties of refrigerants, Selection of refrigerants, Thermodynamic requirements, Chemical requirements, Physical requirements

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		UNIT –V **Vapor-Absorption Refrigeration System:** Working principle, component, calculation, maximum coefficient of performance of a heat operated refrigerating machine, problems on vapor absorption refrigerating system, common refrigerant-absorbent systems. **Psychrometric:** Thermodynamic properties of moist air, Elementary psychrometric process. **Cold Storage**: Principal of cold storage, component of cold storage and operation	**UNIT –V** **Psychrometric:** Psychrometric Properties- Dry air, moist air, water vapour, wet bulb temperature, Dry bulb temperature, dew point temperature, specific humidity, absolute humidity, degree of saturation, Relative humidity, Sensible heat of air, Total heat of air, Humid specific volume, thermodynamic wet bulb temperature or temperature of adiabatic saturation process, psychometric chart and its use. **Air conditioning**– principles –Type and functions of air conditioning, Basic processes in conditioning of air, Psychrometric processes in Air-conditioning equipment; Simple Air-conditioning system and state & mass rate of supply air; Summer air conditioning, Winter air conditioning; Fundamentals of design of air conditioning systems-humidifiers and dehumidifiers – cooling load calculations, types of air conditioners – applications

M. Sreenivasulu

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		Additives in the coolant.Study of radiator efficiency. Study of ignition system of SI engines. Study of electrical system including battery, starting motor, battery charging, cut-out, etc. Comparison of dynamo and alternator. Familiarization with the basics of engine testing.	**Lubrication system**: Lubricant types and study of their properties – lubricating oil tests - system working principles and construction details. **Cooling system** – purpose of cooling - Air cooling – water cooling – pressurized cooling - Study of properties of coolants, antifreeze and anti-corrosion materials - system working principles and construction details
		UNIT III: Study of need for transmission system in a tractor. Transmission system – types, major functional systems. Study of clutch – need, types, functional requirements, construction and principle of operation. Familiarization with single plate, multi-plate, centrifugal and dual clutch systems. Study of Gear Box – Gearing theory, principle of operation, gear box types, functional requirements, and calculation for speed ratio. Study of differential system – need, functional components, construction, calculation for speed reduction. Study of need for a final drive. Study of Brake system – types, principle of operation, construction, calculation for braking torque. Study of steering system – requirements, steering geometry characteristics, functional components, calculation for turning radius. Familiarization with Ackerman steering. Steering systems in track type tractors.	**UNIT-III:** **Steering system** – Qualities of Steering mechanism, Main parts of steering mechanism. Types of steering boxes – working of hydraulic steering, parameters of steering systems-caster angle, camber angle, kingpin inclination and toe-in. **Power transmission system:** Functions of a power transmission system. Clutch – Necessity of clutch in a tractor – Essential features of good clutch –Principalworking of clutch - Types of clutch – Friction clutch-Single Plate clutch, dual clutch and double clutch, Dog clutch and Fluid coupling — constructional detailsand principle of working mechanism. Gearbox– Necessity for providing gearbox – selective sliding type, constant mesh type and partial constant mesh gears – Torque ratio in Gears – working of Gearbox – torqueconverter.
		UNIT IV: Study of Hydraulic system in a tractor – Principle of operation, types, main functional components, functional requirements. Familiarization with the Hydraulic system adjustments and ADDC. Study of tractor power outlets – PTO. PTO standards, types and functional requirements. Introduction to traction. Traction terminology. Theoretical calculation of shear force and rolling resistance on traction device. Study of wheels and tyres – Solid tyres and pneumatic tyres, tyre construction and tyre specifications. Study of traction aids.	**UNIT-IV:** **Differential unit**– Functions of crown wheel – Differential lock – functions. Finaldrive – functions of Final drive. **Brake system** – Principle of operation - Requirements of good braking systems –classification of brakes – Mechanical brake, Hydraulic brake and oil immersed brake - working mechanism. **Hydraulic control system** – working principals – Basic components of Hydraulicsystem – Types of hydraulic system – Position control –Draft control – Mixed control - Precautions for hydraulic system.

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2	Regulation	Pre-Revision	Post-Revision
	Course Title	Farm Power and Tractor Systems	Tractor Systems and Controls
	Course Code	191AG4T05	201AG4T06
	Syllabus	**UNIT-I:** Study of sources of farm power – conventional & non-conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle. General energy equation and heat balance sheet. Study of mechanical, thermal and volumetric efficiencies. Study of engine components their construction, operating principles and functions. Study of engine strokes and comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines. Study of Engine Valve systems, valve mechanism, Valve timing diagram, and valve clearance adjustment Study of Cam profile, valve lift and valve opening area. Study of importance of air cleaning system. Study of types of air cleaners and performance characteristics of various air cleaners. Study of fuel supply system. Study of fuels, properties of fuels, calculation of air-fuel ratio. Study of tests on fuel for SI and CI engines. Study of detonation and knocking in IC engines	**UNIT-I:** Introduction of farm tractor – History and development - classification and selection of farm tractors. Energy sources of Farm Power-Classification of I.C Engines – Study of I.C Engine components and their construction, operating principles and functions – Valves and valve working mechanism. Terminology connected with engine power - measurement of engine power – solved problems
		UNIT II: Study of carburetion system, carburetors and their main functional components. Study offuel injection system – Injection pump, their types, working principles. Fuel injector nozzles – their types and working principle. Engine governing – need of governors, governor types and governor characteristics. Study of lubrication system –need, types, functional components. Study of lubricants – physical properties, additives and their application. Engine cooling system – need, cooling methods and main functional components. Study of need and type of thermostat valves.	**UNIT-II:** **Electrical & ignition systems**: Spark and magneto ignition system - working principles and construction details. **Engine fuel system:** I.C Engine fuels – their properties – Detonation and knocking in IC engines– fuel test – system working principles and construction details – turbo charger- fuel filter – Air cleaner – solved problems. **Engine governing system**: principles – classification - system working principles and construction details – governor hunting – governor regulation.

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			Three-point linkage system – Dash board of tractor – tractor tyre, front and rarewheels, axle – track width adjustment of front wheels.
		UNIT V: Study of tractor mechanics – forces acting on the tractor. Determination of CG of a tractor. Determination and importance of moment of inertia of a tractor. Study of tractor static equilibrium, tractor stability especially at turns. Determination of maximum drawbar pull. Familiarization with tractor as a spring-mass system. Ergonomic considerations and operational safety. Introduction to tractor testing. Deciphering the engine test codes.	**UNIT-V:** **Tractor power out lets**: P.T.O. Construction details– Belt pulley constructional details - Draw bar construction details. **Traction and traction theory:** Traction efficiency – Methods for improving traction – Coefficient of traction – Rolling resistance – Wheel slip or Track slip – Rimpull – crawler tractor. **Center of Gravity**: Suspension method – Balancing method – Weighing method.**Tractor Chassis:** Functions of chassis frame – Tractor chassis – Mechanics of Tractor chassis.

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S.No.	Regulation	Pre-Revision	Post-Revision
	Course Title	Farm Power And Tractor Systems Lab	Tractor Systems And Controls Lab
3	Course Code	191AG4L05	201AG4L04
	Syllabus	1. To study the constructional details of tractors and power tillers of various make and to measure the chassis parameters. 2. To familiarize with tractor controls and to practice the driving of tractor inforward and reverse gears – driving safety rules. 3. To study constructional details of engine components-Assembling and dismantling. 4. To measure PTO or Engine power by using dynamometer. 5. To study the maintenance of air fuel system – cleaning of air – Process to remove air lock in the diesel engine – Precautions in handling diesel fuels in diesel engine. 6. To study the maintenance of lubrication and cooling system– Troubles and remedies – Care and maintenance of lubrication and cooling system. 7. To study the maintenance of transmission system – General maintenance – Differential trouble shooting – Frequent troubles and Remedies. 8. To study the maintenance of electrical system – Ignition system in petrol engine and starting system of diesel engine tractors –working – care and maintenance. 9. To study the maintenance of clutch and brakes – principle operation –frequenttroubles and remedies – care and maintenance. 10. To study the maintenance of steering system – principle of operation – troubleshooting of steering system – care and maintenance of steering system. 11. To study the maintenance of hydraulic system – Working	1. Introduction to different systems of CI engines; Engine parts and functions, working principles etc. 2. Study, construction and adjustments of Valve system. 3. Study of air cleaning system and fuel supply system of SI engine. 4. Study of Lubricating system and its adjustments. 5. Introduction to transmission systems and components. 6. Study of clutch functioning, parts and design problem on clutch system. 7. Study of different types of gear box, calculation of speed ratios, design problems on gear box. 8. Study on differential and final drive and planetary gears. 9. Study of brake systems and some design problems. 10. Study of hydraulic systems in a tractor, hydraulic trainer and some design problems. 11. Determination of location of CG of a tractor, Moment of Inertia of a tractor. 12. Visit to engine manufacturer/ assembler/ spare parts agency

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		principle – Basic components of hydraulic system – Position and Draft controls – Frequent troublesand Remedies – Repairs and maintenance of hydraulic system–Precautions of hydraulic system. 12. To study hitching and unhitching of an implement to a tractor.	
		LIST OF AUGMENTED EXPERIMENTS (Any two of the following experiments can be performed) 13. To study the emission of smoke – Over heating of engines. 14. To study the components and working of 2 stroke engine and 4 stroke engine. 15. To study tractor testing procedure – types of tests – test at main power take off – test at varying speed at full load – Test at varying load – Belt or pulley shaft test. 16. Visit to tractor repairing workshop or tractor industrial visit.	**LIST OF AUGMENTED EXPERIMENTS** (Any two of the following experiments can be performed) 13. Determination of physical properties of Oil & Fuel. 14. Tractor engine heat balance and engine performance curves. 15. Appraisal of various controls in different makes tractors in relation to anthropometric measurements. 16. Determination of traction performance of a traction wheel.

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5	Regulation	Pre-Revision	Post-Revision
	Course Title	Agricultural process engineering	Agricultural process engineering and food quality
	Course Code	171AG5T11	191AG5T11
	Syllabus	**Unit Operation In Agricultural Processing:** Scope and importance crop processing – principles and methods of food processing, cleaning and grading of cereals, pulses & oilseeds. **Size Reduction:** Principles. Size reduction –principle of comminution/ size reduction, mechanisms of comminution of food, particle shape, average particle size. Characteristics of comminuted products, crushing efficiency. Determination and designation of the fineness of ground material, screen analysis, Empirical relationships (Rittinger's, Kick's and Bond's equations).Size reduction equipment –hammer mills and impactors, attrition mills, burr mill, tumbling mills, action in tumbling mills, Size reduction equipment –Ultra fine grinders(classification hammer mills, colloid mill), cutting machines (slicing, dicing, shredding, pulping)	**UNIT-I:** **Unit operation in agricultural Processing:** Scope and importance crop processing – principles and methods of food processing, cleaning, grading, screening, scalping, sorting, size reduction, mixing, separation, drying, storage, milling, material handling, packaging, baking. **Size reduction:** Size reduction –principle of comminution/size reduction, particle shape, average particle size, crushing efficiency. Determination and designation of the fineness of ground material, screen analysis, Empirical relationships (Rittinger's, Kick's and Bond's equations) and related problems. Size reduction equipment – Crushers (Jaw crusher, Gyratory crusher, Crushing rolls), Grinders (Attrition mill, Hammer mill, Ballmill), Fine grinders (Rietz mill or disintegrator, Dispersion and colloid mills) and Cutting machines (Rotary knife cutter).
		UNIT –II **Mixing:** Mixing –Introduction, theory of solids mixing, criteria of mixer effectiveness and mixing index for granular solids, mixing indices, criteria of mixer effectiveness and mixing index for pastes and semi-solid masses, rate of mixing, theory of liquid mixing, power requirement for liquids mixing. Mixing equipment – Mixers for low or medium viscosity liquids (paddle agitators, impeller agitators, and powder-liquid contacting devices), mixers for high viscosity liquids and	**UNIT-II:** **Mixing:** Mixing –Introduction, theory of solids mixing, Mixing of low and moderate viscosity liquids (paddle mixer, turbine mixer, propeller mixer) its applications. Mixing of highviscosity liquids, pastes and plastic solids (pan mixer, kneaders) its applications. Mixers for dry powders and particulate solids (Horizontal screw and ribbon mixer, Vertical screw mixer, tumbling mixer) and its applications, mixing index, **Separator units:** Theory of separation, types of separators, separator based on length, width, shape of the grains, specific gravity, density, cyclone separators,

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		pastes, mixers for dry powders and particulate solids.	Pneumatic separator. Air- screen grain cleaner principle and types, Design considerations of air-screen grain cleaners, Sieve analysis- particle size determination, Ideal screen and actual screen– effectiveness of separation and related problems.
		UNIT-III **Separator Units:** Theory of separation, types of separators, separator based on length, width, and shape of the grains, specific gravity, density cyclone separators, Pneumatic separator. Air-screen grain cleaner principle and types, Design considerations of air-screen grain cleaners, Sieve analysis- particle size determination, Ideal screen and actual screen–effectiveness of separation and related problems	**UNIT-III:** **Drying:** Moisture content and its representation (wet basis, dry basis), methods for determination moisture content (direct and indirect methods) and related problems, Importance of EMC and methods of determination (static-dynamic methods), EMC models, hysteresis effect, bound, unbound and free moisture. Principles of drying, theory of diffusion, mechanism of drying, falling rate, constant rate period, thin layer, deep bed dying methods, Effect of different factors on the drying process, types of dryers.
		UNIT –IV **Drying:** Moisture content and methods for determination, moisture content representation, wet basis, dry basis, direct andindirect methods of moisture content determination, problems, Importance of EMC and method of determination,static-dynamic methods, EMC curve and EMC models, hysteresis effect, bound, unbound and free moisture.Principles of drying, theory of diffusion, mechanism of drying, falling rate, constant rate period, thin layer, deep-bed dying methods, Effect of differentfactors on the drying process, types of dryers	**UNIT-IV:** **Milling and Material handling devices:** Rice milling, principles and equipments, paddy parboiling methods and milling equipment, milling of pulses and oilseeds. Scope and importance of material handling devices, Belt Conveyor– idlers, idler spacing, belt tension, Bucket elevator– classification, operation, capacity, drive mechanism, advantages and disadvantages. Screw conveyor – Principle of operation, capacity, power requirement. Pneumatic conveying system- types, limitations of pneumatic conveying system.
		UNIT –V **Milling and Material Handling Devices:** Rice milling, principles and equipments, paddy parboiling methods and equipment, wheat milling, milling ofpulses and oilseeds. Scope and importance of material handling devices, Belt Conveyor–Inclined belt conveyors, idler spacing,belt tension, drive tension, belt tripper, Screwconveyor – Principle of operation, capacity, power, troughs, loading and discharge.Bucket elevator–	**UNIT-V:** **Food Quality:** Concept, objectives and importance. Sensory evaluation or organoleptic evaluation of food quality, Food laws and regulations in India. Food grade and standards –BIS, AGMARK, PFA, FPO. Hazard analysis and critical control point (HACCP) – objectives, principles, Steps involved in implementation of HACCP.

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		Principle, classification, operation, advantages, disadvantages, capacity, speed. Pneumatic conveyingsystem-capacity and power requirement, types, selection of pneumatic conveying system	

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6	Regulation	Pre-Revision	Post-Revision
	Course Title	Engineering Properties of Biological Materials And Food Quality	Engineering Properties of Biological Materials
	Course Code	171AG4T08	191AG5E01
	Syllabus	**UNIT – I** **Physical Properties**: Physical properties of different food grains, fruits and vegetables – importance. Shape and size – criteria for describing shape and size. Roundness and sphericity – Volume and density – Specific gravity – Bulk density. Porosity – surface area – measurement of the same	**UNIT-I:** **Physical Properties**: Introduction and application of engineering properties of biological material. Physical properties of different food commodities and aided products – importance. Shape and size – criteria for describing shape and size. Roundness and sphericity – Volume and density – Specific gravity – Bulk density. Porosity – surface area – measurement of the same.
		UNIT – II **Rheology:** Rheology – basic concepts – ASTM standard definition of terms. Rheological Properties – Force deformation behavior, stress and strain behavior. Visco – elasticity – time effects, Rheological models. Kelvin and Maxwell models – electrical equivalence of mechanical models. Rheological equations – Maxwell model and generalized Maxwell model. Kelvin model – generalized Kelvin model creep – stress relaxation.	**UNIT-II:** **Rheology:** Introduction to rheology, basic concepts, Classification of rheology,ASTM standard definition of terms. Rheological Properties, Flow behavior of biological materials, force deformation curve; linear elastic limit, yield point, bio- yieldpoint and rupture point. Stress relaxation and creep behavior. Visco-elasticity and visco-plasticity.
		UNIT – III **ENGINEERING PROPERTIES:** **Friction**: basic concepts – effect of load sliding velocity. Friction in agricultural materials –measurement – rolling resistance – angle of internal friction and angle of repose. **Aerodynamics of agricultural products**: drag coefficient – frictional drag and profit drag orpressure drag -and terminal velocity. **Electrical properties:** Di electrical properties. **Thermal Properties:** specific heat – thermal conductivity-thermal diffusivity. Application of engineering properties in handling and processing equipment and also storage	**UNIT-III:** **Rheological models:** Introduction to mechanical models. Kelvin and maxwell models. Electrical equivalence of mechanical models. Rheological equations of maxwell model, generalized maxwell model, kelvin model and generalized kelvin model. Difference between kelvin and maxwell model. Viscosity; Measurement of viscosity using viscometer, types of viscometer, problems on viscometer.

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		UNIT – IV **Food Quality:** Concept, objectives and importance. Food quality, control – methods of quality control sampling – purpose. Quality control – sampling techniques. Sampling procedures for liquid, powdered and granular materials. Sensory evaluation or organoleptic evaluation of food quality, methods. **Total Quality Management:** Parameters of total quality management. The evolution of total quality management – total quality management (TQM). Total quality control principles of qualitycontrol – consumer preference and acceptance	**UNIT-IV:** **Frictional Properties**: Basic concepts, effect of load sliding velocity. Friction in agricultural materials, measurement. Rolling resistance, angle of internal friction and angle of repose. Applications of frictional properties in design of processing equipment. **Aerodynamic Properties:** Importance of aerodynamic properties in Agricultural Processing equipments with examples. Terminal velocity and drag coefficient; frictional drag and profit drag or pressure drag. Terminal velocity of different grains, working of pneumatic conveyor based on aerodynamic properties
		UNIT – V **Food Laws:** Food laws and regulations in India. Food grade and standards –BIS, AGMARK, PFA, FPO. Sanitation in food industry – GMP. ISO 9000 series of standards. Hazard analysis and critical control point (HACCP) – objectives – principles – Steps involved in implementation of HACCP. Application of HACCP concept to milk and milk products – problems in implementing HACCP. FSSAI act 2006	**UNIT-V:** **Electrical properties:** Di-electrical properties; Dielectric loss factor and dielectricconstant. Applications and role of electrical properties in food processing. **Thermal Properties:** Introduction to thermal properties; Specific heat, thermal conductivity, thermal diffusivity, latent heat of vaporization, latent heat of fusion, sensible heat, enthalpy and heat energy calculation.

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4	Regulation	Pre-Revision	Post-Revision
	Course Title	Design of Agricultural Machinery	Theory And Design of Agricultural Machinery
	Course Code	171AG8E17	191AG5T10
	Syllabus	**UNIT-I:** **Introduction to Machine Design**: Definition, classification and general considerations in machine design, general procedure in machine design. Simple stress in machine parts – tensile, compressive, bending and shear stress. Stress - strain diagram, working stress, factor of safety, stresses in composite bars, thermal stress. Principal stresses and principal planes. Theories of failure under static load - Rankine's theory, Guest's theory and maximum distortion theory. Stress concentration and notch sensitivity	**UNIT-I:** Introduction, Element, Link, Pairs. Kinematic pairs- Types, lower and higher pairs. Mechanism, machine and structure. Kinematics chains- Four bar chain, slider crank chain and their inversions. **Belt, Rope and Chain Drives**: types of belt, rope and chain drives. Belt materials, Length of belt, Power transmitted, Velocity ratio, Belt size for flat and v-belts. Effect of centrifugal tension, creep and slip on power transmission. Problems on belt, rope and chain drives
		UNIT-II: **Cotter joint**: Types of cotter joints, design of socket and spigot cotter joint. **Knuckle joint:** Dimensions of various parts of knuckles joint, methods of failure of knucklejoint, design procedure of knuckle joint. **Levers**: Introduction, application of levers in engineering practice, design of levers - hand lever,foot lever and cranked lever. **Springs**: Introduction, terminology, types of springs, material for helical springs, springs inseries and parallel, flat spiral springs, leaf springs, construction of leaf springs	**UNIT-II:** **Gears:** Types of gears, Law of gearing. Velocity of sliding between two teeth in mesh Involute and cycloidal profile for gear teeth. Spur gear, nomenclature, interference and undercutting. Introduction to helical, spiral, bevel and worm gear. **Gear Trains**: Simple, compound, reverted and epicyclical gear trains - Determining the velocity ratio by tabular method
		UNIT III: **Shafts:** Material used for shafts, types and sizes of shafts. Design of shafts based on axial, bending, twisting, combined bending and twisting, buckling and fluctuating loads. Design of shafts on the basis of deflection and rigidity. **Keys and couplings**: Introduction, types of keys - sunk key, saddle key, tangent key, round key and splines. Forces acting on sunk key. Effect of key ways. Shaft couplings – definition and types, muff coupling,	**UNIT-III:** **Flywheel:** Turning moment Diagrams, Coefficient of fluctuation of speed and energy. Weight of fly wheel, flywheel applications. **Clutch**: Types of friction, Laws of dry fiction, Friction of pivots and collars. Singledisc, Multiple disc and cone clutches.

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		design of flange coupling.	
		UNIT IV: **Fly wheel**: Introduction, coefficient of fluctuation of speed, fluctuation of energy, maximum fluctuation of energy, energy stored in a flywheel, design of flywheel. **Bearing**: Introduction, classification of bearing, types of sliding contact bearings, rolling contact bearings, radial ball bearings, advantages and disadvantages of rolling contact bearingover sliding contact bearings. Standard dimensions and designations of ball bearings, basic static load rating of rolling contact bearings, life of a bearing. Basic dynamic load rating of rolling contact bearings, dynamic load rating for rolling contact bearings under variable loads, reliability of bearing.	**UNIT-IV:** **Shafts:** Material used for shafts, types and sizes of shafts. Design of shafts- basics, axial, bending, twisting, combined bending and twisting, buckling and fluctuating loads. **Keys and couplings**: Introduction, types of keys-sunk key, saddle key, tangent key, round key and splines. Forces acting on sunk key. Effect of keyways. Shaft couplings– definition and types, design of flange coupling, muffle coupling, Hooke's coupling.
		UNIT V: **Design of Machinery**: Design of agricultural machinery - cultivator, rotavator, tractor operated seed cum fertilizer drill, tractor mounted boom sprayer, harvesting and threshing equipment.	**UNIT-V:** **Springs**: Introduction, terminology, types of springs, material for helical springs, springs in series and parallel, flat spiral springs, leaf springs, construction of leaf springs. **Balancing of Masses**: Static and dynamic balancing, Balancing of rotating masses inone and different planes. **Cams and follower**: Introduction, classification of followers and cams, terms used in radial cams, motion of the follower- Uniform and Simple harmonic motion

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9	Regulation	Pre-Revision	Post-Revision
	Course Title	Farm Machinery And Equipment Lab-I	Agricultural Machinery and Equipment Lab
	Course Code	171AG8E17	191AG6L11
	Syllabus	1. To study the various farm machinery equipments. 2. To visit the industry and ICAR, SAU'S research stations for exposure on present usage of farm machinery. 3. To measure vertical suction, horizontal suction and throat clearance of MB plough. 4. To determine the field capacity and field efficiency of primary tillage implements. 5. To measure the draft and fuel consumption of different farm equipment. 6. To determine disc angle, tilt angle and concavity of a disc plough. 7. To study and practice the various field operation patterns/ploughing methods. 8. To calibrate the seed cum fertilizer drill. 9. To calibrate the sprayers. 10. To measure the furrow cross-section by using furrow profile meter. 11. To find soil resistance by using cone penetrometer. 12. To practice the hitching of different implements to the tractor **List of Augmented experiments (Any two of the following experiments can be performed)** **13. To study about testing and evaluation of farm implements.** 14. To find the weeding efficiency of different weeders. 15. To study the productivity of earth moving equipment through exposure visit. 16. To study and measure the adjustments of tractor-implement hitching.	1. Introduction to various farm machines. 2. Construction details, adjustments and working of M.B. plough, Disc ploughand Disc harrow and secondary tillage tools. 3. Implement performance for different implements under different soilconditions (Atleast two machines). 4. Tractor performance under different soil conditions. 5. Working of seed-cum-fertilizer drills, planters and their calibration in field. 6. Construction and working of rotavators and other rotary tillers, measurementof speed & working width. 7. Construction and working of rice and crop transplanter for potato, sugarcane, cotton etc., and their field operation patterns. 8. To study weeding equipment and their use. 9. Study of sprayers and dusters, measurement of nozzle discharge, fieldcapacity etc. 10. To study the various types of mowers, constructional details, materials andworking. 11. To study the various types of reaper, constructional details, materials used, working and performance. 12. Familiarization with various Farm machines related to harvesting, threshing, root harvesting, combine etc. (Groundnut diggers, Potato harvesters etc.) **List of Augmented Experiments: (Weeks 13 – Week 16** 13. To study about testing and evaluation of farm implements.

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		17. To study about maintenance of farm implements and equipment. 18. To practice the various sowing methods	14. To study the construction details of brush cutter. 15. To study balers construction in detail. 16. To study the various types of forage harvesters, constructional details, materials used and working

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7	Regulation	Pre-Revision	Post-Revision
	Course Title	Farm Machinery And Equipment-I	Agricultural Machinery And Equipment
	Course Code	171AG6T15	191AG6T14
	Syllabus	**UNIT-I** **Farm Mechanization:** Definition, concept of farm mechanization in India, status of farm mechanization, mechanization index, objectives of farm mechanization, constraints in mechanization, scope and benefits of farm mechanization, limiting factors in farm mechanization, suggestions for farm mechanization. Farm power availability in India, sources of farm power, merits and demerits of different forms of power, classification of farm machines. **Materials of construction**- Ferrous metal and non-ferrous material and heat treatment of steel	**UNIT-I:** **Introduction to farm mechanization:** Classification of farm machines. Introduction to materials used in construction of farm machines. Heat treatment processes and their requirement in farm machines. Selection of farm machinery and cost estimation. Hitching systems and controls of farm machinery. Introduction to seed-bed preparation. Familiarization with land reclamation and earth moving equipment. Methods of Ploughing.
		UNIT-II **Tillage:** Definition, objectives of tillage, classification and types of tillage. Primary tillage implements: Indigenous plough and its parts, adjustments in indigenous plough. Mould board plough and its components, types of mould board ploughs, adjustments of mould board plough,plough accessories. Disc plough and types of disc plough, terminology related to disc plough and adjustments of disc plough; subsoiler, chisel plough, rotary plough, rotating auger ploughand rotavators. Ploughing operations: Terminology and methods of ploughing. Plough hitchingterminology: center of pull, center of plough load, line of pull, horizontal hitch adjustments, and vertical hitch adjustments. Secondary tillage equipment: Harrows, cultivators, clod crushers, levellers and other implements, puddler, bund former, ridger, soil scoop, green manure trampler. Miscellaneous equipment: post- hole digger, hydroger, ditcher, shrub cutter, blade terrace, hydraulic scraper.	**UNIT-II:** **Tillage Practices:** Definition, primary tillage, secondary tillage, rotary tillage, deep tillage, minimum tillage and conservation tillage. Draft measurement of tillage equipment, Identification and major functional components of mould-board plough, disc plough, chisel plough, sub-soiler, harrows, cultivators, levelling, Forces acting on tillage implements. Cost of operation of farm machinery.
		UNIT-III	**UNIT-III:** **Introduction to inter-culture**

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		Tillage performance parameters: Draft of implements and its measurement. Field capacity – theoretical, actual and field efficiency. Solved problems on tillage performance parameters. **Cost of cultivation:** Method of cost estimation, fixed cost and variable cost. Solved problemsrelated to cost of cultivation. **Forces acting upon tillage implements**: Mould board plough, disc plough and disc harrow- Solved problems on force analysis.	**equipments**: Weeder – manual and powered, main components and their functional requirement. **Introduction to sowing, planting & transplanting equipment:** Study of working ofseed drills, no-till drills, happy seeder and strip-till drills. Brief description and working of planters. Study of types of furrow openers and metering systems in drills and planters. Calibration of seed-drills/ planters. Adjustments during operation. Introduction to plant protection equipment – sprayers and dusters. **Classification of sprayers.** Types of nozzles. Calculations for calibration of sprayers and chemical application rates.
		UNIT-IV **Sowing**: Definition, sowing methods; Seed cum fertilizer drill-types, components, different types of seed and fertilizer metering mechanisms, different types of furrow openers. Calibrationof Seed cum fertilizer drills. Solved problems related to seeding and calibration of seed cum fertilizer drill. **Transplanting**: Definition, rice transplanter and vegetable transplanter, types and their working principle; Solved problems.	**UNIT-IV:** **Study of harvesting operation** – methods and terminology. Study of Reapers, Mowers and windrowers – types, working and adjustments. Introduction to threshing systems – manual and mechanical systems. Types of threshing drums and their applications. Types of threshers-tangential and axial, factors affecting thresher performance. Chaff cutters and capacity calculations.
		UNIT-V **Plant protection equipment:** Objectives and uses, types of sprayers and dusters. Sprayercomponents and types of nozzles. Sprayer performance and calibration. **Weeding and Intercultural operations**: Definition, types of weeding equipment- manual, mechanical and flame weeding; Equipment for plant thinning. **Earth moving equipment**: Terminology, Earth moving equipment, shovels, jointers, bulldozers, loaders and Trenchers	**Unit - V** Study of grain combines (Wheat and Paddy) - Combine terminology, Computation of combine losses, study of combine troubleshooting. Study of Root crop diggers – potato and groundnut. Cotton harvesting mechanisms, study of cotton pickers and strippers. Introductionto vegetables and fruit harvesting equipment and tools.

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AGRICULTURAL MACHINERY AND EQUIPMENT LAB

VI Semester **L T P C**
Course Code: 191AG6L11 **0 0 3 1.5**

Course Outcomes:
At the end of the Course, Student will be able to:

CO 1: Explain the different types equipments for tillage operations.
CO 2: Measure draft, field capacity and efficiency of various farm implements.
CO 3: Determine the different parameters for different tillage implements.
CO 4: Demonstrate working principles of various harvesting and threshing machinery.
CO 5: Explain the constructional details and working of different harvesting and threshing method for different crops and fruits.

Mapping of course outcomes with program outcomes:

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

Mapping of course outcomes with program Specific Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3
CO1	1	-	-
CO2	2	-	-
CO3	2	-	-
CO4	3	-	-
CO5	3	-	-

List of Experiments:

1. Introduction to various farm machines.
2. Construction details, adjustments and working of M.B. plough, Disc plough and Disc harrow and secondary tillage tools.
3. Implement performance for different implements under different soilconditions (Atleast two machines).
4. Tractor performance under different soil conditions.
5. Working of seed-cum-fertilizer drills, planters and their calibration in field.
6. Construction and working of rotavators and other rotary tillers, measurementof speed & working width.
7. Construction and Working of rice and crop transplanter for potato, sugarcane, cotton etc., and their field operation patterns.
8. To study weeding equipment and their use.
9. Study of sprayers and dusters, measurement of nozzle discharge, field capacity etc.
10. To study the various types of mowers, constructional details, materials and working.

11. To study the various types of reaper, constructional details, materials used, working and performance.
12. Familiarization with various Farm machines related to harvesting, threshing, root harvesting, combine etc. (Groundnut diggers, Potato harvesters etc.)

List of Augmented Experiments: (Weeks 13 – Week 16)
(Any two of the following experiments can be performed)

1. To study about testing and evaluation of farm implements.
2. To study the construction details of brush cutter.
3. To study balers construction in detail.
4. To study the various types of forage harvesters, constructional details, materials used and working.

Reference Books:

1. Farm Machinery, Stone A A 1958. John wiley and sons, New York.
2. Farm Machinery and Equipment. Smith H.P. 1971. Tata McGraw-Hills Publishing Co.,Ltd., New Delhi.
3. Testing and Evaluation of Agricultural Machinery. Mehta M.L., Verma S.R. Misra S.K. and Sharma V.K. Daya Publishing House, New Delhi.
4. Farm Machinery and Equipment, Smith H P 1971. Tata McGraw Hill Publishing Co.Ltd., New Delhi.

Web Links:

1. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2262
2. http://www.hillagric.ac.in/edu/coa/agengg/lecture/243/agriengg-243.htm
3. http://www.agrimoon.com/farm-power-and-machinery-icar-ecourse-pdf-book/

ADITYA ENGINEERING COLLEGE

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Department of Mining Engineering

Syllabus revision Index

Academic Year 2021-2022

S.No	Name of the course	Percentage of syllabus change
1	Geo-Statistics through SURPAC	20
2	Mineral Processing Technology	30
4	Rock Excavation Engineering	20
5	Mineral Processing Lab	40

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Department of Mining Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Geo-statistics	Geo-Statistics through SURPAC
Course Code	191MI4T08	201SO3L09
Syllabus	**UNIT – I** Introduction to Statistics Arithmetic mean; Median; Mode; Standard deviation; Mean deviation or the average deviation; coefficient of variance; coefficient of correlation; Rank correlation. Probability distribution function; Normal distribution function; Poisson distribution function; Exponential distribution; Expectation of a variance. Skewness.	**UNIT-I**: Introduction to Statistics: Arithmetic mean; Median; Mode; Standard deviation; Mean deviation or the average deviation; coefficient of variance; coefficient of correlation; Rank correlation. Probability distribution function; Normal distribution function; Poisson distribution function; Exponential distribution; Expectation of a variance
	UNIT – II Theories of Probability Additional theory of probability; Theorem of total probability for compound events; Bay's theorem; Mean square error; Cramer Rao theorem for evaluating estimator.	**UNIT-II**: Theories of Probability: Additional theory of probability; Theorem of total probability for compound events; Bay's theorem; Mean square error.
	UNIT – III Sampling Sampling definition and its equipment, Type of sampling, Methods of sampling-grab sampling, channel sampling, chip sampling, face sampling, bulk sampling, drill hole sampling, Error in sampling, 4 step sampling technique.	**UNIT-III**: Sampling: Type of sampling, Methods of sampling- grab sampling, channel sampling, chip sampling, face sampling, bulk sampling, drill hole sampling, Error in sampling.
	UNIT – IV Traditional Approaches to Reserve Estimation Tonnage factor; Determination of average grade of ore in a vertical section; Determination of average grade of ore in a horizontal section- Triangular method, Polygons method, Constant distance weighting technique, Inverse distance weighting technique.	**UNIT-IV**: Reserve Estimation: Traditional Approaches to Reserve Estimation Tonnage factor; Determination of average grade of ore in a vertical section; Determination of average grade of ore in a horizontal section-Triangular method, Polygonal method, Constant distance weighting technique, Inverse distance weighting technique. Geo-statistical approach for reserve estimation Krigging

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	UNIT – V Statistical Approach to Reserve Estimation Application of statistics on the orebody; Global and Local estimation; Point and Block estimates; Random variables; Random function; Variogram; Quantification of deposits through variogram.	**UNIT-V:** Introduction to SURPAC: Determination lease boundaries using bearings and distance. Determination of lease boundaries using co-ordinates. DTM surface from a String File. Introduction to Geological data. Creation of Geological Data Base, Generation and displaying of drill holes, Creation of 3-D Block Model. Calculation of volume and tonnage using string file.

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Regulation	Pre-Revision	Post-Revision
Course Title	Mineral Processing Technology	Mineral Processing Technology
Course Code	171MI6T14	191MI6T13
Syllabus	**UNIT-I** Introduction to Mineral Processing: General Principle: Mineral Beneficiation and its role in mineral exploitation.; Comminution and Liberation: Theory. And practice of crushing and grinding and practice of crushing and grinding, performance and choice of crushers and grinding mills	**UNIT-I** Introduction- Scope, objectives and limitations of mineral processing; liberation and beneficiation of minerals; Characteristics of mineral and coal. Comminution- Theory and practice of crushing and grinding; Different types of crushing and grinding equipment-application and limitations.
	UNIT – II: Mineral Screening: Laboratory techniques, Industrial screens and screening efficiency; concentration: Theory and practice of classification, classifiers Their performance and choice, Picking and washing techniques.	**UNIT-II** Size Separation- Laboratory size analysis and interpretation, different types of industrial screen and screening efficiency; Theory and practice of classification, classifiers their performance and choice, Classifier efficiency. Float and Sink analysis- Theory of float and sink of mineral and coal, washability analysis of coal, Tromp curve of coal
	UNIT – III: Mineral Separation: Theory and application of sink and float, jigging and flowing mil concentration- methods and equipment used; Froth Flotation: Physio chemical principles, flotation reagents, flotation machines and circuits, application to common sulphides, oxides and oxidized minerals.	**UNIT-III** Mechanics of settling of particle - Terminal settling velocity, Equal settling particle, hindered settling; Hydrocyclone- concept and mechanism, types of hydro cyclone Dense medium separation Mechanism of dense media separation; Jigging Mechanism, cycle, variable in operation etc. Baum jig, Harz and other types of Jigs. Tabling - Wilfley and other types of tabling operation, Material used for suspension, Separating vessels and their relative merits and demerits. Froth flotation- Principle, flotation reagents, flotation machines and circuits, application to common sulphide, oxides and oxidized mineral
	UNIT – IV: Modern Mineral Separators: Electrostatic and Electro-Magnetic Separation-Principles, operations and fields of applications.	**UNIT-IV** Flocculation and thickners- Principle of flocculation, types of flocculants, design features of thickners, vanners and their application Dewatering and Drying-Filtration- pressure and suction filters, their relative merits and demerits, filter and filtration cycle; Drying- rate of drying, compartment, rotary and other types of dryer and their operational features. Magnetic Separation- Paramagnetic and diamagnetic substances, Industrial

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		magnetic separator and their selection criteria. Electrical Separation of Minerals- Electrostatic and electrodynamic methods, plate and roll type separators. Factor affecting design of high tension roll separators. Electrostatic precipitation. Single and two stage separations. Operation features of ESMS such as Cottrell precipitator.
	UNIT – V: Flow Charts for Various Mineral Processing: Simplified flow sheets for the beneficiation of beachs and, coal and typica lores of copper, lead, zinc and manganese with special reference to India and deposits.	**UNIT-V** Hydro-metallurgical methods of concentration- Leaching- principle, various methods and applications. Flow sheet design- Flowsheet for coal, copper, lead, zinc, gold, manganese and limestone

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Regulation	Pre-Revision	Post-Revision
Course Title	Rock Fragmentation Engineering	Rock Excavation Engineering
Course Code	171MI6E09	191MI6E12
Syllabus	UNIT-I: Drilling of Rocks in Underground and Surface Mines: General theory of rock cutting, Selection of cutting tools for optimum penetration. Classification of drilling system. Rock drilling methods, parameters affecting the choice of drilling.	UNIT-I: Introduction Concepts and historical developments and design in rock excavation, factors affecting rock fragmentation, mechanism of rock breakage and fractures. Rock Fragmentation: Method of rock fragmentation - explosive action, cutting, ripping and impacts
	UNIT-II: Mechanics of rotary, percussive and rotary - percussive drilling, short and long hole drilling equipment, different types of bits, bit wear, drilling in difficult formations, drillbility of rocks, drilling performance and costs.	UNIT-II: Physio- Mechanical Properties of Rocks Application 'of compression, tensile and multi - axial strength, index test and abrasivity, anisotropy, elasticity, porosity, lamination, bedding joints in rock fragmentation process.
	UNIT-III: Mechanism of Rock breaking machines, pneumatic and Hydraulic rock hammers. Mechanics of rock fragmentation and fracture by explosive action, explosives.	UNIT-III: Principles of Rock Cutting Technology: Drilling and its various types i.e., rotary, percussive; rotary - percussive mechanism of rock percussion, theory of single tool rock cutting, crack initiation, propagation and breakage pattern. Drillability Drillability index, rock cutting picks, discs and rolls cutter. Water jet cutting, Jet piercing technique, determination of Drillability index
	UNIT-IV: Blasting accessories, blasting parameters, design of blasting rounds for opencast and underground mines, blastability of rocks, blasting efficiency, mean fragment size, misfires, blown out shots, incomplete detonation, their causes and remedial measures.	UNIT-IV: Equipments for Rock Excavation Excavation in surface mines- Shovel, Dragline and Bucket Wheel Excavators, Surface miner Excavation in underground mines- Continuous miners, Road headers, TBM, Coal face cutters, Loaders
	UNIT-V: Controlled blasting techniques, perimeter blasting, safety precautions, ground vibrations and air over pressure from blasting. Instrumentation for blast monitoring, Borehole pressure transducer, V.O.D Probe, vibration monitor, Impact of ground vibration and air overpressure	UNIT-V: Rock Cutting Tools Cutting tool material – types, relative application and their choice, tool shape and size, specific energy consumption, tool wear.

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	on the neighboring structures and communities, and mitigate measures. Case Studies.	

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Regulation	Pre-Revision	Post-Revision
Course Title	Mineral Processing Technology Lab	Mineral Processing Lab
Course Code	171MI6L05	191MI6L06
Syllabus	List of Experiments: 1. To determine and analyze the size distribution of a fixed granular solid by using a Test Sieve Stack. 2. To determine and analyze the size distribution of a fixed granular solid by using a Vibratory Shaker. 3. Determination of average size by sieving of a crushed ore sample in the Jaw Crusher. 4. To study the jaw crusher and determination the actual capacity. 5. Determine the reduction ratio of an ore sample in Jaw Crusher. 6. Verification of Rittinger's law of Crushing. 7. Determination of average size by sieving of crushed Ore sample in roller crusher. 8. To study the effect of grinding with grinding time in Ball mill. 9. To study the effect of grinding with frequency (RPM) in Ball mill. 10. Perform the beneficiation of an Ore pulp mix using Floatation Cell. 11. Study of magnetic separator, and effect of magnetic field on efficiency of the process. 12. Perform the Jigging operation to detecting the rate of stratification. List of Augmented Experiments: 1. Crushing of Coal in the Jaw Crusher, and Determination of average size by sieving. 2. Determine the theoretical capacity and actual capacity of a roller crusher. 3. Compare the reduction ratio of an ore sample and the coal sample. 4. Determine the reduction ratio of a coal sample in Jaw Crusher. 5. Determine the reduction ratio of a coal sample in Ball mill.	List of Experiments: 1.To do Sampling by Using Conning and quartering and John Riffle and calculation of error 2. Determination of various sized product by using different Sieve shaker 3. Determination of average size reduction by Jaw crusher and study their theoretical and actual capacity 4. Determination of average size by sieving of crushed Ore sample in roller crusher. 5. To study the effect of grinding with grinding time in Ball mill. 6. To study the effect of grinding with frequency (RPM) in Ball mill. 7. Determination of Washability Curve by using Float -sink analysis., 8. Determination of Proximate analysis of coal. 9. Perform the beneficiation of an Oxide ore pulp mix using Floatation Cell. 10. Perform the beneficiation of an sulphide ore pulp mix using Floatation cell 11. Study of magnetic separator, and effect of magnetic field on efficiency of the process. 12. Perform the Jigging operation to detecting the rate of stratification. List of Augmented Experiments: 1. Crushing of Coal in the Jaw Crusher, and Determination of average size by sieving. 2. Determine the theoretical capacity and actual capacity of a roller crusher. 3. Compare the reduction ratio of an ore sample and the coal sample. 4. Determine the reduction ratio of a coal sample in Jaw Crusher. 5. Determine the reduction ratio of a coal sample in Ball mill.

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Department of Civil Engineering

Syllabus revision Index for the Academic Year 2021-2022M.TechStructural Engineering

S.No	Name of the course	Percentage of syllabus change
1	IndustrialStructures	20
2	Bridge Engineering	20

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Bridge Engineering	Bridge Engineering
Course Code	1925T1E04	1925T1E04
Syllabus	UNIT–I: Concrete bridges: Introduction-Types of Bridges-Economic span Length –Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loadsLongitudinal forces-Seismic loads- Frictional resistance of expansion bearingsSecondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements.	UNIT–I: Concrete bridges: Introduction-Types of Bridges-Economic span Length –Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loadsLongitudinal forces-Seismic loads- Frictional resistance of expansion bearingsSecondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements.
	UNIT–II: Pigeaud's method: Design of longitudinal girders-Guyon-Messonet method-Hendry Jaegar method-Courbon's theory. (Ref: IRC-21), voided slabs, Super Structure: Slab bridge- Wheel load on slab- effective width method-slabs supported on two edges-cantilever slabs- dispersion length-Design of interior panel of slab-T-Beam bridges	UNIT–II: Pigeaud's method: Design of longitudinal girders-Guyon-Messonet method- Hendry Jaegar method-Courbon's theory. (Ref: IRC-21), voided slabs, Super Structure: Slab bridge- Wheel load on slab-effective width method- slabs supported on two edges- cantilever slabs-dispersion length- Design of interior panel of slab- T-Beam bridges
	UNIT–III: Box culverts: Single Cell Box Culvert – Design Loads, Design Moments, Shears and Thrusts. Design of Critical sections.	UNIT–III: Box culverts: Single Cell Box Culvert – Design Loads, Design Moments, Shears and Thrusts. Design of Critical sections.
	UNIT–IV: Plate girder bridges: Elements of plate girder and their design-web flange-intermediate stiffeners-vertical stiffeners-bearing stiffener-design problem.	UNIT–IV: Plate girder bridges: Elements of plate girder and their design-web flange-intermediate stiffeners-vertical stiffeners-bearing stiffener-design problem.

	UNIT–V: Sub structure: Abutments- Stability analysis of abutments- piers- loads on piers – Analysis of piers- Design problem(Ref: IRC-13, IRC-21, IRC-78)- Pipe culvert- Flow pattern in pipe culvers- culvert alignment-culvert entrance structure- Hydraulic design and structural design of pipe culverts- reinforcements in pipes.(Ref: IRC: SP-13)	UNIT–V: Design of Prestressed Concrete Bridge Flexural and Torsional parameters - Courbon's Theory - Distribution Coefficient by exact analysis - Design of girder section - maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - Cable Zone in Girder - Check for stresses at various sections - Check for diagonal tension - Diaphragms - End Block - Short term deflections

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	INDUSTRIAL STRUCTURES	INDUSTRIAL STRUCTURES
Course Code	192ST3E15	192ST3E15
Syllabus	UNIT-I: Planningandfunctionalrequirements-classificationofindustriesandindustrialstructures-planningforlayout-requirementsregardinglightingventilationandfiresafety-protectionagainst noise and vibrations	UNIT-I: Planningandfunctionalrequirements-classificationofindustriesandindustrialstructures-planningforlayout-requirementsregardinglightingventilationandfiresafety-protectionagainst noise and vibrations
	UNIT-II: Industrialbuildings-roofsforindustrialbuildings(Steel)-designofgantrygirder-designofcorbels andnibs-machine foundations	UNIT-II: Industrialbuildings-roofsforindustrialbuildings(Steel)-designofgantrygirder-designofcorbels andnibs-machine foundations
	UNIT–III: DesignofPre-EngineeredBuildings.	UNIT–III: DesignofPre-EngineeredBuildings.
	UNIT-IV:Powerplantstructures-Bunkersandsilos-chimneyandcoolingtowers-NuclearcontainmentStructures	UNIT-IV: Powerplantstructures-Bunkersandsilos-chimneyandcoolingtowers-NuclearcontainmentStructures Types of power plants - Design of turbo generator foundation - Raw material handling systems - Conveyors (Belt and Pipe conveyors) - Stacking and storage mechanisms - Containment structures.

	UNIT-V: Powertransmissionstructures-transmissionlinetowers-towerfoundations-testingtowers.	UNIT-V: Powertransmissionstructures-transmissionlinetowers-towerfoundations-testingtowers.Auxiliary Structures: Intro to Wind load calculations - Design of steel and RCC Chimneys - Bunkers and silos - Flat and conical bottoms.

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Department of Electrical and Electronics Engineering

(Power Electronics and Drives)

Syllabus revision Index for 2021-2022

S. No	Name of the course	Percentage of syllabus change
1	Programmable Logic Controllers & Applications	20
2	Artificial Intelligence Techniques	80
3	Digital Control Systems	20
4	Advanced Digital Signal Processing	20

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Aditya Engineering College (A)

Department of Electrical and Electronics Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Programmable Logic Controllers & Applications**	**Programmable Logic Controllers & Applications**
Course Code	**192PD1E03**	**192PD1E03**
Syllabus	**UNIT - I: PLC Basics:** PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams.	**UNIT - I: PLC Basics:** PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules
	UNIT - II: PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams for process control: Ladder diagrams and sequence listings, ladder diagram construction.	**UNIT - II: PLC Programming:** Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams for process control: Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.
	UNIT - III: PLC Registers: Characteristics of Registers, module addressing, holding registers, input registers, output registers. PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions.	**UNIT - III: PLC Registers:** Characteristics of Registers, module addressing, holding registers, input registers, output registers. PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions.
	UNIT - IV: Data Handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL,	**UNIT - IV: Data Handling functions:** SKIP, Master control Relay, Jump, Move, FIFO, FAL,

	ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axis and three axis Robots with PLC.	ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axis and three axis Robots with PLC, Matrix functions
	UNIT - V: Analog PLC operation: Analog modules and systems, Analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator with PID control.	**UNIT - V: Analog PLC operation:** Analog modules and systems, Analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator with PID control., PID modules, PID tuning, PID functions

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Artificial Intelligence Techniques**	**Artificial Intelligence Techniques**
Course Code	**192PD1E04**	**192PD1E04**
Syllabus	**UNIT–I: Introduction: Artificial Neural Networks (ANN)** – definition and fundamental concepts – Biological neural networks –Artificial neuron – activation functions – setting of weights – typical architectures – biases and thresholds– learning/training laws and algorithms. Perceptron – architectures, ADALINE and MADLINE – linear separability-XOR function	**UNIT – 1: Introduction to Neural Networks** Introduction, Humans and Computers, Biological Neural Networks, Historical development of neural network, Terminology and Topology, Biological and artificial neuron models, Basic learning laws.
	UNIT–II: ANN Paradigms: ADALINE – feed forward networks – Back Propagation algorithm- number of hidden layers – gradient decent algorithm – Radial Basis Function (RBF) network. Kohonen"s self organizing map (SOM), Learning Vector Quantization (LVQ) and its types – Functional Link Networks (FLN) – Bidirectional Associative Memory (BAM) – Hopfield Neural Network.	**UNIT- 2: Feed Forward Neural Networks** Introduction, Perceptron models: Discrete, continuous and multi-category, Training algorithms: Discrete and Continuous Perceptron Networks, Perceptron convergence theorem, Limitations and applications of the Perceptron model, Generalized delta learning rule, Feedforward recall and error back propagation training-Radial basis function algorithms-Hope field networks
	UNIT–III: Classical and Fuzzy Sets: Introduction to classical sets-properties, Operations and relations; Fuzzy sets, Membership, Operations, Properties, Fuzzy relations, Cardinalities, Membership functions.	**UNIT -3: Genetic algorithms &Modelling**-Introduction-encoding-fitness function-reproduction operators-genetic operators-cross over and mutation-generational cycle-convergence of genetic algorithm
	UNIT–IV: Fuzzy Logic Controller (FLC): Fuzzy logic system components: Fuzzification, Inference	**UNIT – 4: Classical and Fuzzy Sets** Introduction to classical sets - properties, operations and relations;

	engine (development of rule base and decision making system), Defuzzification to crisp sets-Defuzzification methods.	Fuzzy sets, membership, Uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzy Logic System Components-Fuzzification, Membership value assignment, development of rule base and decision making system, defuzzification to crisp sets, defuzzification methods.
	UNIT–V: Application of AI Techniques: Speed control of DC motors using fuzzy logic –load flow studies using back propagation algorithm, single area and two area load frequency control using fuzzy logic.	**UNIT-5: Application of AI Techniques:** Design of PI controller for speed control of DC motor using neural networks and fuzzy logic-PWM Controllers -Selected harmonic elimination PWM- Space vector PWM using neural network.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Digital Control Systems**	**Digital Control Systems**
Course Code	**192PD2E09**	**192PD2E09**
Syllabus	**UNIT–I: Introduction:** Introduction to analog and digital control systems – Advantages of digital systems – Typical examples– Sample and hold devices – Sampling theorem and data reconstruction- Transfer functions and frequency domain characteristics of zero order hold and first order hold. Review of Z–transforms and Inverse Z–transforms- solving differential equations. Mapping between the S–Plane and the Z–Plane – Primary strips and Complementary Strips	**UNIT – I: Introduction:** Block Diagram of typical control system- advantages of sampling in control systems – examples of discrete data and digital systems – data conversion and quantization – sample and hold devices – D/A and A/D conversion – sampling theorem – reconstruction of sampled signals – ZOH. Z-transform: Definition and evaluation of Z-transforms – mapping between s-plane and z-plane – inverse z-plane transform – theorems of the Z-transforms –limitations of z-transforms –pulse transfer function –pulse transfer function of ZOH –relation between G(s) and G(z) – signal flow graph method applied to digital systems.
	UNIT–II: State space analysis and the concepts of Controllability and observability: State Space Representation of discrete time systems – State transition matrix properties and evaluation – Solution of state equations- Discretization of continuous- time state equations – controllability and observability – concepts, conditions and tests, Principle of duality.	**UNIT–II: State space analysis and the concepts of Controllability and observability:** State Space Representation of discrete time systems – State transition matrix properties and evaluation – Solution of state equations- Discretization of continuous- time state equations – controllability and observability – concepts, conditions and tests, Principle of duality.
	UNIT–III: Stability Analysis and Controller Design: Stability criterion – Modified Routh"s stability criterion and Jury"s stability	**UNIT–III: Stability Analysis and Controller Design:** Stability criterion – Modified Routh"s stability criterion and Jury"s stability

	test, Lyapunov"s stability analysis. Design of state feedback controller through pole placement techniques, Necessary and sufficient conditions, Ackermann"s formula, controller for deadbeat response, control system with reference input, Design of full order observer-reduced order observer.	test, Lyapunov"s stability analysis. Design of state feedback controller through pole placement techniques, Necessary and sufficient conditions, Ackermann"s formula, controller for deadbeat response, control system with reference input, Design of full order observer-reduced order observer.
	UNIT–IV: State Observer: Necessary and sufficient condition for state observation-Full order state observer- error dynamics – design of prediction observers- Ackermann"s formula-effect of the addition of observer on closed loop system-Current observer- minimum order observer observed – state feedback control system with minimum order observer -control system with reference input.	**UNIT-V: Digital State Observer:** Design of – Full order and reduced order observers. Design by max. Principle: Discrete Euler language equation-discrete maximum principle.
	UNIT–V: Quadratic Optimal Control Systems: Quadratic optimal control problems-Solution by minimization method using Lagrange multipliersEvolution of the minimum performance index – discretize quadratic optimal control – Steady state Riccati equations-Lyapunov approaches to the solution of the Steady state quadratic optimal regulator problem and optimal control problem - Quadratic optimal control of a servo system.	**UNIT–V: Quadratic Optimal Control Systems:** Quadratic optimal control problems-Solution by minimization method using Lagrange multipliersEvolution of the minimum performance index – discretize quadratic optimal control – Steady state Riccati equations-Lyapunov approaches to the solution of the Steady state quadratic optimal regulator problem and optimal control problem - Quadratic optimal control of a servo system.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	**Advanced Digital Signal Processing**	**Advanced Digital Signal Processing**
Course Code	**192PD2E10**	**192PD2E10**
Syllabus	**UNIT–I: Digital Filter Structure:** Block diagram representation-Equivalent Structures-FIR and IIR digital filter Structures All pass Filters-tunable IIR Digital Filters-IIR tapped cascaded Lattice Structures-FIR cascaded Lattice structures-Parallel-Digital Sine-cosine generator-Computational complexity of digital filter structures.	**UNIT–I: Digital Filter Structure:** Block diagram representation-Equivalent Structures-FIR and IIR digital filter Structures All pass Filters-tunable IIR Digital Filters-IIR tapped cascaded Lattice Structures-FIR cascaded Lattice structures-Parallel-Digital Sine-cosine generator-Computational complexity of digital filter structures.
	UNIT–II: Digital filter design: Preliminary considerations-Bilinear transformation method of IIR filter design of low pass, high pass-band pass, and band stop- IIR digital filters-Spectral transformations of IIR filters, FIR filter design-based on windowed Fourier series- design of FIR digital filters with least –mean square- error-constrained least-square design of FIR digital filters.	**UNIT–II: Optimum Filters:** Wiener filters - FIR Wiener filter - discrete Wiener Hopf equation, Applications - filtering, linear prediction. IIR Wiener filter - causal and non-causal filters. Recursive estimators - discrete Kalman filter.
	UNIT–III: DSP algorithm implementation: Computation of the discrete Fourier transform- number representation arithmetic operations handling of overflow-tunable digital filters-function approximation.	**UNIT–III: DSP algorithm implementation:** Computation of the discrete Fourier transform- number representation arithmetic operations handling of overflow-tunable digital filters-function approximation.
	UNIT–IV: Analysis of finite Word length effects: The quantization process and errors- quantization of fixed –point and floating -point Numbers-Analysis of coefficient	**UNIT–IV: Analysis of finite Word length effects:** The quantization process and errors- quantization of fixed –point and floating -point Numbers-Analysis of

	quantization effects, Analysis of arithmetic round-off errors, dynamic range scaling-signal- to- noise ratio in low -order IIR filters-low- sensitivity digital filters-Reduction of Product round-off errors using error feedback-Limit cycles in IIR digital filters, Round-off errors in FFT Algorithms.	coefficient quantization effects, Analysis of arithmetic round-off errors, dynamic range scaling-signal- to- noise ratio in low -order IIR filters-low-sensitivity digital filters-Reduction of Product round-off errors using error feedback- Limit cycles in IIR digital filters, Round-off errors in FFT Algorithms.
	UNIT–V: Power Spectrum Estimation: Estimation of spectra from finite duration observations signals – Nonparametric methods for power spectrum estimation – parametric method for power spectrum estimation, estimation of spectral form-finite duration observation of signals-non- parametric methods for power spectrum estimation-Walsh methods-Blackman & torchy method.	**UNIT–V: Power Spectrum Estimation:** Estimation of spectra from finite duration observations signals – Nonparametric methods for power spectrum estimation – parametric method for power spectrum estimation, estimation of spectral form-finite duration observation of signals-non-parametric methods for power spectrum estimation-Walsh methods-Blackman & torchy method.

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Department of Mechanical Engineering

M.Tech-Thermal Engineering

Syllabus revision Index (2021-22)

S. No	Name of the course	Percentage of syllabus change
1	Jet Propulsion & Rocket Engineering	20
2	Convective Heat Transfer	20

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SURAMPALEM-533 437

Department of Mechanical Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Jet Propulsion & Rocketry	Jet Propulsion & Rocket Engineering
Course Code	172TE2E15	192TE2E13
Syllabus	**UNIT-I:** **Turbo Jet Propulsion System:** Gas turbine cycle analysis – layout of turbo jet engine. Turbo machinery-compressors and turbines, combustor, blade aerodynamics, engine off design performance analysis. Flight Performance: Forces acting on vehicle – Basic relations of motion – multi stage vehicles.	**UNIT-I:** **Turbo Jet Propulsion Systems:** Gas turbine cycle analysis, layout of turbo jet engine. Turbo machinery, compressors and turbines, combustor, blade aerodynamics, engine off design performance analysis. Flight Performance: Forces acting on vehicle, Basic relations of motion, multi stage vehicles
	UNIT-II: **Principles of Jet Propulsion and Rocketry:** Fundamentals of jet propulsion, Rockets and air breathing jet engines – Classification – turbo jet , turbo fan, turbo prop, rocket (Solid and Liquid propellant rockets) and Ramjet engines. Nozzle Theory and Characteristics Parameters: Theory of one dimensional convergent – divergent nozzles – aerodynamic choking of nozzles and mass flow through a nozzle – nozzle exhaust velocity – thrust, thrust coefficient, Ac At of a nozzle, Supersonic nozzle shape, no adapted nozzles, summer field criteria, departure from simple analysis – characteristic parameters – 1) characteristic velocity, 2) specific impulse 3) total impulse 4) relationship between the characteristic parameters 5) nozzle efficiency, combustion efficiency and overall efficiency.	**UNIT-II:** **Principles of Jet Propulsion and Rocketry:** Fundamentals of jet propulsion, Rockets and air breathing jet engines, Classification, turbo jet, turbo fan, turbo prop, rocket (Solid and Liquid propellant rockets) and Ramjet engines. Nozzle Theory and Characteristics Parameters: Theory of one dimensional convergent, divergent nozzles, aerodynamic choking of nozzles and mass flow through a nozzle, nozzle exhaust velocity, thrust, thrust coefficient, Ac / At of a nozzle, Supersonic nozzle shape, non, adapted nozzles, Summerfield criteria, departure from simple analysis, characteristic parameters,1) characteristic velocity, 2) specific impulse 3) total impulse 4) relationship between the characteristic parameters 5) nozzle efficiency, combustion efficiency and overall efficiency.

	UNIT-III: **Aero Thermo Chemistry of the Combustion Products:** Review of properties of mixture of gases – Gibbs – Dalton laws – Equivalent ratio, enthalpy changes in reactions, heat of reaction and heat of formation calculation of adiabatic flame temperature and specific impulse – frozen and equilibrium flows. Solid Propulsion System: Solid propellants – classification, homogeneous and heterogeneous propellants, double base propellant compositions and manufacturing methods. Composite propellant oxidizers and binders. Effect of binder on propellant properties. Burning rate and burning rate laws, factors influencing the burning rate, methods of determining burning rates	**UNIT-III:** **Aero Thermo Chemistry of the Combustion Products:** Review of properties of mixture of gases, Gibbs, Dalton laws, Equivalent ratio, enthalpy changes in reactions, heat of reaction and heat of formation, calculation of adiabatic flame temperature and specific impulse, frozen and equilibrium flows. Solid Propulsion System: Solid propellants, classification, homogeneous and heterogeneous propellants, double base propellant compositions and manufacturing methods. Composite propellant oxidizers and binders. Effect of binder on propellant properties. Burning rate and burning rate laws, factors influencing the burning rate, methods of determining burning rates.
	UNIT-IV: **Solid propellant rocket engine:** Internal ballistics, equilibrium motor operation and equilibrium pressure to various parameters. Transient and pseudo equilibrium operation, end burning and burning grains, grain design. Rocket motor hard ware design. Heat transfer considerations in solid rocket motor design. Ignition system, simple pyro devices. Liquid Rocket Propulsion System: Liquid propellants – classification, Mono and Bi propellants, Cryogenic and storage propellants, and ignition delay of hypergolic propellants, physical and chemical characteristics of liquid propellant. Liquid propellant rocket engine – system layout, pump and pressure feed systems, feed system components. Design of combustion chamber, characteristic length, constructional features, and chamber wall stresses. Heat transfer and cooling aspects. Uncooled engines, injectors – various types, injection patterns, injector characteristics, and atomization and drop size distribution, propellant tank design.	**UNIT-IV:** **Solid Propellant Rocket Engine:** Internal ballistics, equilibrium motor operation and equilibrium pressure to various parameters. Transient and pseudo equilibrium operation, end burning and burning grains, grain design. Rocket motor hard ware design. Heat transfer considerations in solid rocket motor design. Ignition system, simple pyro devices. Liquid Rocket Propulsion System: Liquid propellants, classification, Mono and Bi propellants, Cryogenic and storage propellants, ignition delay of hypergolic propellants, physical and chemical characteristics of liquid propellant. Liquid propellant rocket engine, system layout, pump and pressure feed systems, feed system components. Design of combustion chamber, characteristic length, constructional features, and chamber wall stresses. Ramjet and Integral Rocket Ramjet Propulsion System: Fuel rich solid propellants, gross thrust, gross thrust coefficient, combustion efficiency of ramjet engine, air intakes and their classification, critical, super critical and sub, critical operation of air intakes, engine intake matching.

	UNIT-V: **Ramjet and Integral Rocket Ramjet Propulsion System:** Fuel rich solid propellants, gross thrust, gross thrust coefficient, combustion efficiency of ramjet engine, air intakes and their classification – critical, super critical and subcritical operation of air intakes, engine intake matching, classification and comparison of IIRR propulsion systems.	**UNIT-V:** **Rocket Testing:** Types of Tests; Test Facilities and Safeguards; Safety and Environmental Concerns; Monitoring and Control of Toxic Materials and Exhaust Gases; Instrumentation and Data Management; Reliability and Quality Control; Flight Testing.

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Department of Mechanical Engineering

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Convective Heat Transfer	Convective Heat Transfer
Course Code	172TE2E10	192TE1E19
Syllabus	**UNIT-I:** **Introduction:** Forced, free & combined convection – convective heat transfer coefficient – Application of dimensional analysis to convection – Physical interpretation of dimensionless numbers. Equations of Convective Heat Transfer: Continuity, Navier-Strokes equation & energy equation for steady state flows – similarity , Equations for turbulent convective heat transfer – Boundary layer equations for laminar, turbulent flows – Boundary layer integral equations.	**UNIT-I:** **Introduction**: Free, forced combined convection, convective heat transfer coefficient, Application of dimensional analysis to convection, Physical interpretation of dimensionless numbers. Equations of Convective Heat Transfer: Continuity, Navier, Strokes equation & energy equation for steady state flows, similarity, Equations for turbulent convective heat transfer, Boundary layer equations for laminar, turbulent flows, Boundary layer integral equations.
	UNIT-II: **External Laminar Forced Convection**: Similarity solution for flow over isothermal plate – integral equation solutions – Numerical solutions – Viscous dissipation effects on flow over a flat plate. External Turbulent Flows: Analogy solutions for boundary layer flows Integral equation solutions – Effects of dissipation on flow over a flat plate. Internal Laminar Flows: Fully developed laminar flow in pipe, plane duct & ducts with other cross-sectional shapes – Pipe flow & plane duct flow with developing temperature field – Pipe flows & plane duct flow with developing velocity & temperature fields. Internal Turbulent Flows: Analogy solutions for fully developed pipe flow – Thermally developing pipe & plane duct flow.	**UNIT-II:** **External Laminar Forced Convection**: Similarity solution for flow over isothermal plate – integral equation solutions – Numerical solutions – Viscous dissipation effects on flow over a flat plate. External Turbulent Flows: Analogy solutions for boundary layer flows Integral equation solutions – Effects of dissipation on flow over a flat plate. Internal Laminar Flows: Fully developed laminar flow in pipe, plane duct & ducts with other cross-sectional shapes – Pipe flow & plane duct flow with developing temperature field – Pipe flows & plane duct flow with developing velocity & temperature fields. Internal Turbulent Flows: Analogy solutions for fully developed pipe flow – Thermally developing pipe & plane duct flow.

	UNIT-III: **Natural Convection:** Boussineq approximation – Governing equations – Similarity –Boundary layer equations for free convective laminar flows – Numerical solution of boundary layer equations. Free Convective flows through a vertical channel across a rectangular enclosure – Horizontal enclosure – Turbulent natural convection.	**UNIT-III:** **Natural Convection:** Bouss in eqap proximation, Governing equations, Similarity, Boundary layer equations for free convective laminar flows, Numerical solution of boundary layer equations. Free Convective flows through a vertical channel across a rectangular enclosure, Horizontal enclosure, Turbulent natural convection
	UNIT-IV: **Combined Convection**: Governing parameters & equations – laminar boundary layer flow over an isothermal vertical plate – combined convection over a horizontal plate – correlations for mixed convection – effect of boundary forces on turbulent flows – internal flows - internal mixed convective flows – Fully developed mixed convective flow in a vertical plane channel & in a horizontal duct.	**UNIT-IV:** **Combined Convection:** Governing parameters & equations, laminar boundary layer flow over an isothermal vertical plate, combined convection over a horizontal plate, correlations for mixed convection, effect of boundary forces on turbulent flows, internal flows , internal mixed convective flows, Fully developed mixed convective flow in a vertical plane channel & in a horizontal duct Convective Heat Transfer Through Porous Media: Area weighted velocity, Darcy flow model, energy equation, boundary layer solutions for 2, D forced convection, Fully developed duct flow
	UNIT-V: **Convective Heat Transfer through Porous Media:** Area weighted velocity – Darcy flow model – energy equation – boundary layer solutions for 2- D forced convection – Fully developed duct flow – Natural convection in porous media – filled enclosures – stability of horizontal porous layers	**UNIT-V:** **Mass Transfer:** Types, Fick's law of diffusion, Steady state diffusion, Multicomponent diffusion, Measurement and prediction of diffusion coefficients, Diffusion in variable area, Molecular diffusion in liquids solids and gel, Knudsen diffusion. **Convective Mass Transfer and Mass Transfer Coefficients:** Types of mass transfer coefficient, dimensionless groups in mass transfer and various correlations Turbulent or eddy diffusion, Governing equations, forced diffusion from flat plate, dimension less correlation for mass transfer.

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Department of Computer Science and Engineering

Syllabus revision Index 2021-2022

S.No	Name of the course	Percentage of syllabus change
1	Digital Image Processing	20%
2	Soft Computing	20%
3	Principles of computer security	20%

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Digital Image Processing	Digital Image Processing
Course Code	172CO2E06	192CS1E02
Syllabus	**UNIT-I:** **Introduction:** Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. **Image Enhancement Techniques:** Spatial Domain Methods: Basic grey level transformation, Histogram equalization.	**UNIT-I:** **Introduction:** Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. **Image Enhancement Techniques:** Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image subtraction, image averaging.
	UNIT-II: **Spatial filtering:** Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters, Homomorphism is filtering. Image Restoration & Reconstruction: Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering, Minimum mean square Error filtering, constrained least square filtering.	**UNIT-II:** **Spatial filtering:** Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters, Homomorphism is filtering. Image Restoration & Reconstruction: Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering, Minimum mean square Error filtering, constrained least square filtering, Geometric mean filter, Image reconstruction from projections. Color Fundamentals, Color Models, Color Transformations
	UNIT-III: **Image Compression:** Redundancies-Coding, Interpixel, Psycho visual; Fidelity, Source and Channel Encoding, Elements of Information	**UNIT-III:** **Image Compression:** Redundancies-Coding, Interpixel, Psycho visual; Fidelity, Source and Channel Encoding, Elements of Information Theory; Loss

	Theory; Loss Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization.	Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization, Entropy coding, LZW coding; Image Compression Standards-JPEG, JPEG 2000, MPEG; Video compression.
	UNIT-IV: **Wavelet Based Image Compression:** Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform.	**UNIT-IV:** **Wavelet Based Image Compression:** Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding.
	UNIT-V: **Image Segmentation:** Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds; Introduction to morphological operations; binary morphology- erosion, dilation, opening and closing operations, applications; basic grayscale morphology operations; Feature extraction.	**UNIT-V:** **Image Segmentation:** Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds; Introduction to morphological operations; binary morphology- erosion, dilation, opening and closing operations, applications; basic grayscale morphology operations; Feature extraction; Classification; Object recognition. Digital Image Watermarking: Introduction, need of Digital Image Watermarking, applications of watermarking in copyright protection and Image quality analysis.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Soft Computing	Soft Computing
Course Code	192CS2E09	192CS2E09
Syllabus	**UNIT-I:** **Fuzzy Set Theory:** Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic function and Terminology, Set-theoretic Operations, Member Function Formulation and arameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models.	**UNIT-I:** **Fuzzy Set Theory:** Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic function and Terminology, Set-theoretic Operations, Member Function Formulation and arameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modeling.
	UNIT-II: **Optimization:** Derivative based Optimization, Descent Methods, and The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms.	**UNIT-II:** **Optimization:** Derivative based Optimization, Descent Methods, and The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing, and Random Search, Downhill Simplex Search.
	UNIT-III: **Artificial Intelligence:** Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic	**UNIT-III:** **Artificial Intelligence:** Introduction, Knowledge Representation, Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic

	Reasoning Under Uncertainty Basic knowledge Representation Issues Knowledge acquisition.	Reasoning Under Uncertainty Basic knowledge Representation Issues Knowledge acquisition, Heuristic Search: Techniques for Heuristic search Heuristic Classification State Space Search: Strategies Implementation of Graph Search based on Recursion Patent-directed Search Production System and Learning.
	UNIT-IV: **Neuro Fuzzy Modeling:** Adaptive Neuro-Fuzzy Inference Systems,Architecture Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN Coactive Neuro Fuzzy Modeling.	**UNIT-IV:** **Neuro Fuzzy Modeling:** Adaptive Neuro-Fuzzy Inference Systems, Architecture Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks Neuro Fuzzy Spectrum.
	UNIT-V: **Applications of Computational Intelligence:** Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction.	**UNIT-V:** **Applications of Computational Intelligence:** Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Coloripe Prediction.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Principles of computer security	Principles of computer security
Course Code	192CS2E11	192CS2E11
Syllabus	**UNIT-I:** **Introduction:** Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements Fundamental Security Design Principles, Attack Surfaces and Attack Trees, Computer Security Strategy. Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption.	**UNIT-I:** **Introduction:** Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, Fundamental Security Design Principles, Attack Surfaces and Attack Trees, Computer Security Strategy. Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers.
	UNIT-II: **User Authentication:** Electronic User Authentication Principles, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication. Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, UNIX File Access Control.	**UNIT-II:** **User Authentication:** Electronic User Authentication Principles, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication. Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, UNIX File Access Control, Role-Based Access Control, Attribute-Based Access Control, Identity, Credential, and Access Management, Trust Frameworks.

	UNIT-III: **Database and Cloud Security:** The Need for Database Security, Database Management Systems, Relational Databases, SQL Injection Attacks, Database Access Control, Database Encryption, Cloud Computing, Cloud Security Risks And Countermeasures, Data Protection In The Cloud, Cloud Security As A Service. Malicious Software: Types of Malicious Software (Malware), Advanced Persistent Threat, Propagation, Infected Content, Viruses, Propagation, Vulnerability Exploit, Worms, Propagation, Social Engineering, Spam E-Mail, Trojans, Payload, System Corruption, Payload.	**UNIT-III:** **Database and Cloud Security:** The Need for Database Security, Database Management Systems, Relational Databases, SQL Injection Attacks, Database Access Control, Database Encryption, Cloud Computing, Cloud Security Risks And Countermeasures, Data Protection In The Cloud, Cloud Security As A Service. Malicious Software: Types of Malicious Software (Malware), Advanced Persistent Threat, Propagation, Infected Content, Viruses, Propagation, Vulnerability Exploit, Worms, Propagation, Social Engineering, Spam E-Mail, Trojans, Payload, System Corruption, Payload, Attack Agent, Zombie, Bots, Payload, Information Theft, Key loggers, Phishing, Spyware, Payload, Stealthing, Backdoors, Root kits, Countermeasures.
	UNIT-IV: **Denial-of-Service Attacks:** Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of-Service Attacks,Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack.	**UNIT-IV:** **Denial-of-Service Attacks:** Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of-Service Attacks,Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack. Software Security:Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs.
	UNIT-V: **Operating System Security:** Introduction To Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security,	**UNIT-V:** **Operating System Security:** Introduction To Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security,

	Windows Security, Virtualization Security.	Windows Security, Virtualization Security. Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.

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Department of Electronics and communication Engineering

Syllabus revision Index (V.L.S.I.D.)

2021-22

S.No	Name of the course	Percentage of syllabus change
1	MEMS Technology	20
2	Photonics	20
3	IoT & Its Applications	20

G. Sai Srinivas

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	MEMS Technology	MEMS Technology
Course Code	192VD1E03	192VD1E03
Syllabus	**UNIT-I:** **Introduction to MEMS:** Introduction to MEMS& Real world Sensor/Actuator examples (DMD, Air-bag, pressure sensors). MEMS Sensors in Internet of Things (IOT), Bio-Medical Applications.	**UNIT-I:** **Introduction to MEMS:** Introduction to MEMS& Real world Sensor/Actuator examples (DMD, Air-bag, pressure sensors). MEMS Sensors in Internet of Things (IOT), Bio-Medical Applications.
	UNIT-II: **MEMS Materials and Their Properties:** Materials (eg.Si, SiO2, SiN, Cr, Au, Ti, SU8, PMMA, Pt);Important properties: Young modulus, Poisson "sratio, density, piezo-resistive coefficients, TCR, Thermal Conductivity, Material Structure. Understanding Selection of materials based on application	**UNIT-II:** **MEMS Materials and Their Properties:** Materials (eg.Si, SiO2, SiN, Cr, Au, Ti, SU8, PMMA, Pt);Important properties: Young modulus, Poisson "sratio, density, piezo-resistive coefficients, TCR, Thermal Conductivity, Material Structure. Understanding Selection of materials based on application
	UNIT-III: **MEMS Fab Processes–1:** Understanding MEMS Processes& Process parameters for: Cleaning, Growth& Deposition, Ion Implantation &Diffusion, Annealing, Lithography. Understanding selection of Fab processes based on Applications.	**UNIT-III:** **MEMS Fab Processes–1:** Understanding MEMS Processes& Process parameters for: Cleaning, Growth& Deposition, Ion Implantation &Diffusion, Annealing, Lithography. Understanding selection of Fab processes based on Applications. **MEMS Fab Processes–2:** Understanding MEMS Processes &Process parameters for: Wet & Dry etching, Bulk & Surface Micromachining, Die, Wire & Wafer Bonding, Dicing, Packaging. Understanding selection of Fab processes based on Applications.

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	UNIT-IV: **MEMS Fab Processes–2:** Understanding MEMS Processes &Process parameters for: Wet & Dry etching, Bulk & Surface Micromachining, Die, Wire & Wafer Bonding, Dicing, Packaging. Understanding selection of Fab processes based on Applications.	**UNIT-IV:** **MEMS Devices:** Architecture, working and basic quantitative behavior of Cantilevers, Microheaters, Accelerometers, Pressure Sensors, Micromirror sin DMD, Inkjet printer-head. Understanding steps involved in Fabricating above devices.
	UNIT-V: **MEMS Devices:** Architecture, working and basic quantitative behavior of Cantilevers, Microheaters, Accelerometers, Pressure Sensors, Micromirror sin DMD, Inkjet printer-head. Understanding steps involved in Fabricating above devices.	**UNIT-V:** Advanced MEMS for Sensing and Actuation: Electromechanical effects: Piezoresistance - Piezoelectricity - Shape memory alloy-Thermal effects: Temperature coefficient of resistance - Thermo-electricity – Thermocouples – Micro fluidics: - Squeeze film damping - Surface tension and bubbles -Devices: pumps, valves, mixers -Integrated fluidic systems: BioMEMS.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Photonics	Photonics
Course Code	192VD1E06	192VD1E06
Syllabus	**UNIT-I:** **Laser Systems:** General description, Laser structure, Single mode laser theory, Excitation mechanism and working of: CO2, Nitrogen, Argonion, Excimer, X-ray, Free-electron, Dye, Nd: YAG, Alexanderite and Ti: sapphire lasers, Diode pumped solid state laser, Optical parametric oscillator (OPO) lasers. Optical amplifiers-Semiconductor optical amplifiers, Erbium doped waveguide optical amplifiers, Raman amplifiers, Fiber Lasers. Laser Applications-Lasers in Isotope separation, Laser interferometry and speckle metrology, Velocity measurements.	**UNIT-I:** **Laser Systems:** General description, Laser structure, Single mode laser theory, Excitation mechanism and working of: CO2, Nitrogen, Argonion, Excimer, X-ray, Free-electron, Dye, Nd: YAG, Alexanderite and Ti: sapphire lasers, Diode pumped solid state laser, Optical parametric oscillator (OPO) lasers. Optical amplifiers-Semiconductor optical amplifiers, Erbium doped waveguide optical amplifiers, Raman amplifiers, Fiber Lasers. Laser Applications-Lasers in Isotope separation, Laser interferometry and speckle metrology, Velocity measurements.
	UNIT-II: **Properties of laser Radiation:** Introduction, Laser line width ,Laser frequency stabilization, Beam divergence, Beam coherence, Brightness ,Focusing properties of laser radiation, Q-switching ,Methods of Q-switching: Rotating-mirror method ,Electro- optic Q-switching, Acoustic- optic Q-switching and Passive Q-switching, Mode locking, Methods of mode locking: Active and passive mode locking techniques, Frequency doubling and Phase conjugation	**UNIT-II:** **Properties of laser Radiation:** Introduction, Laser line width ,Laser frequency stabilization, Beam divergence, Beam coherence, Brightness ,Focusing properties of laser radiation, Q-switching ,Methods of Q-switching: Rotating-mirror method ,Electro- optic Q-switching, Acoustic- optic Q-switching and Passive Q-switching, Mode locking, Methods of mode locking: Active and passive mode locking techniques, Frequency doubling and Phase conjugation
	UNIT-III: **Opto -Electronic Devices-I:** Introduction, P-N junction diode,	**UNIT-III:** **Opto -Electronic Devices-I:** Introduction, P-N junction diode,

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	Carrier recombination and diffusion in P-N junction, Injection efficiency, Internal quantum efficiency, Hetero-junction, Double hetero-junction, Quantum well, Quantum dot and Super lattices; LED materials, Device configuration and efficiency.	Carrier recombination and diffusion in P-N junction, Injection efficiency, Internal quantum efficiency, Hetero-junction, Double hetero-junction, Quantum well, Quantum dot and Super lattices; LED materials, Device configuration and efficiency.
	UNIT-IV: **Opto-Electronic Devices-II:** Light extraction from LEDs, LED structures-single hetero structures, double heteros structures, Device performances and applications, Quantum well lasers; Photodiode and Avalanche photodiodes (APDs), Laser Diodes-Amplification, Feedback and oscillation, Power and efficiency, Spectral and spatial characteristics	**UNIT-IV:** **Opto-Electronic Devices-II:** Light extraction from LEDs, LED structures-single hetero structures, double heteros structures, Device performances and applications, Quantum well lasers; Photodiode and Avalanche photodiodes (APDs), Laser Diodes-Amplification, Feedback and oscillation, Power and efficiency, Spectral and spatial characteristics
	UNIT–V: **Modulation of Light:** Introduction, Birefringence, Electro-optic effect, Pockets and Kerr effects, Electro-optic Phase modulation, Electro-optic amplitude modulation, Electro-optic modulators: scanning and switching, Acousto-optic effect, Acousto-optic modulation, Raman-Nath and Bragg modulators: deflectors and spectrum analyzer, Magneto-optic effect, Faraday rotator and optical isolator. Advantages of optical modulation.	**UNIT–V:** **Optical communication systems** Modulation schemes, Analog modulation, Digital modulation, Free space communications, Fiber optical communication systems ,Operating wavelength, Emitter design, Detector design, Fiber choice , Optical amplifiers,System design considerations, Wavelength division multiplexing , Coherent systems, Solitons.

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1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	IoT & Its Applications	IoT & Its Applications
Course Code	192VD2E08	192VD2E08
Syllabus	**UNIT-I:** **Fundamentals of IoT:** Evolution of Internet of Things, Enabling Technologies, IoT Architectures,oneM2M, IoT World Forum (IoT WF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects. IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards	**UNIT-I:** **Fundamentals of IoT:** Evolution of Internet of Things, Enabling Technologies, IoT Architectures,oneM2M, IoT World Forum (IoT WF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects. IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards
	UNIT-II: **IoT Protocols:** IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: Co AP and MQTT.	**UNIT-II:** **IoT Protocols:** IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: Co AP and MQTT.
	UNIT-III: **Design And Development:** Design Methodology, Embedded	**UNIT-III:** **Design And Development:** Design Methodology, Embedded

	computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.	computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.
	UNIT-IV: **Data Analytics And Supporting Services:** Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning – No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django, AWS for IoT, System Management with NETCONF-YANG.	**UNIT-IV:** **Securing IoT** A Brief History of OT Security , Common Challenges in OT Security, Erosion of Network Architecture, Pervasive Legacy Systems, Insecure Operational Protocols, Modbus, DNP3 (Distributed Network Protocol), ICCP (Inter-Control Center Communications Protocol), OPC (OLE for Process Control), International Electrotechnical Commission (IEC) Protocols , Other Protocols, Device Insecurity , Security Knowledge
	UNIT-V: **Case Studies/Industrial Applications:** IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT, Industry 4.0 concepts. Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino).	**UNIT-V:** **Case Studies/Industrial Applications:** IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT, Industry 4.0 concepts. Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino).

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Signature of the HOD

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Department of Petroleum Technology

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Advanced well logging techniques and well testing analysis	Advanced well logging techniques and well testing analysis
Course Code	192PE1E04	192PE1E04
Syllabus	UNIT-III: Cement bond log- Casing collar log-Depth control- Perforation technique-Casing inspection logs. Production logging: Solving production problems with the help of Fluid Density log-Temperature log and Flow meter logs	UNIT-III: Principles and operation of Dip-meter logs. Interpretation of Dip meter logs to obtain structural dips of the layers encountered in the borehole and correlation of the same with the nearby offset wells

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Department of Petroleum Technology

1.1.2. Table-Prior/Post revision of syllabus

Regulation	Pre-Revision	Post-Revision
Course Title	Advanced well completions	Advanced well completions
Course Code	192PE2E06	192PE2E06
Syllabus	UNIT-V: Well completion: Types of wells- Completion functions- Types of completion	UNIT-V: Installation of Completion Systems: Wellbore Clean-out and mud displacement, Completion fluids and filtration, Well clean-up and flow initiation.

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Department of Management Studies

Syllabus revision Index (2021-22)

S.No	Name of the course	Percentage of syllabus change
1.	Cyber Laws & Security	20
2.	Information Systems & Audit	20
3.	SAP	20

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Department of Management Studies

1.1.2. Table-Prior/Post revision of syllabus (2021-22)

Regulation	Pre-Revision	Post-Revision
Course Title	Cyber Laws & Security	Cyber Laws & Security
Course Code	16IM903	174SY4E03
Syllabus	UNIT-1: Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.	UNIT-1: Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.
	UNIT-2: Secure System Planning and administration: Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations	UNIT-2: Secure System Planning and administration: Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations
	UNIT-3: Information security policies and procedures: Corporate policies-Tier 1, Tier 2 and Tier3 policies - process management-planning and preparationdeveloping policies-asset classification policy-developing standards	UNIT-3: Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparationdeveloping policies-asset classification policy-developing standards
	. UNIT-4: Information security: fundamentals-Employee responsibilities- information classification Information handling-Tools of information security-Information processing-secure program administration.	. UNIT-4: Information security: fundamentals-Employee responsibilities- information classification Information handling-Tools of information security-Information processing-secure program administration.

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	UNIT-5: Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals. Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit	UNIT-5: E – commerce and Laws in India (a) Digital ,Electronic Signature in Indian Laws E – Commerce; Issues and provisions in Indian Law E – Governance; concept and practicality in India E – Taxation issues in Cyberspace E – Contracts and its validity in India Cyber Tribunal & Appellate Tribunal (g) Cyber Regulations

D. Mehaji

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N. Visal

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1.1.2. Table-Prior/Post revision of syllabus (2021-22)

Regulation	Pre-Revision	Post-Revision
Course Title	Information Systems & Audit	Information Systems & Audit
Course Code	16IM904	174SY4E04
Syllabus	Overview of Information System Auditing: Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit..	UNIT-1: Overview of Information System Auditing: Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit
	. UNIT-2: The Management Control UNIT-II: The Management Control Framework-I: Introduction, Evaluation the Planning Function, Leading Function and Controlling Function, Systems Development - Management Controls, Approaches to Auditing Systems Development , Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls	. UNIT-2: The Management Control Framework-I: Introduction, Evaluation the Planning Function, Leading Function and Controlling Function, Systems Development - Management Controls, Approaches to Auditing Systems Development , Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.
	UNIT-III: The Management Control Framework-II: Security Management Controls, Operations Management Controls Quality Assurance Management Controls- Case Studies. UNIT-V: Evidence Evaluation: Evaluating Asset Safeguarding and Data Integrity, Evaluating System Effectiveness, Evaluating System Efficiency. Information Systems Audit and Management: Managing the Information Systems Audit Function	Database Management – Data Base Concepts – Data Structure – Data Base Management System – Data Base Files – Data Mining and Warehousing

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	UNIT-IV: Evidence Collection: Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools- Case Studies.	UNIT-4: Evidence Collection: Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools- Case Studies.
	. UNIT-5: Evidence Evaluation: Evaluating Asset Safeguarding and Data Integrity, Evaluating System Effectiveness, Evaluating System Efficiency. Information Systems Audit and Management: Managing the Information Systems Audit Function,	. UNIT-5: Evidence Evaluation: Evaluating Asset Safeguarding and Data Integrity, Evaluating System Effectiveness, Evaluating System Efficiency. Information Systems Audit and Management: Managing the Information Systems Audit Function,

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1.1.2. Table-Prior/Post revision of syllabus (2021-22)

Regulation	Pre-Revision	Post-Revision
Course Title	SAP	SAP
Course Code	16IM905	175SY9E09
Syllabus	Introduction to data warehouses: Introduction to Data Warehouse, OLTP Systems; Differences between OLTP Systems and Data Warehouse: Characteristics, Functions, Applications and types of Data Warehouse. SAP Portfolio Overview: Identify the parts of the SAP Portfolio, Listing the key capabilities of SAP Net weaver, considering the Release strategy of SAP	Introduction to data warehouses: Introduction to Data Warehouse, OLTP Systems; Differences between OLTP Systems and Data Warehouse: Characteristics, Functions, Applications and types of Data Warehouse. SAP Portfolio Overview: Identify the parts of the SAP Portfolio, Listing the key capabilities of SAP Net weaver, considering the Release strategy of SAP
	UNIT-II: Introduction to Object – Oriented Programming: Object-Oriented Programming Model, Analyzing and Design Unified Modeling Language (UML), Class, Objects, Constructors. Business Processes Management: Definition, Process of BPM, Process Models, BPM Life Cycle, Process Identification, Core Processes, Support Processes.	UNIT-II: Business processes and scenarios: Definition, Why BPM, what is a business process, various Process Models, BPM Life Cycle, Process Identification, core processes, support processes
	UNIT-III: Organizational Management Concepts: Organizational Management Concepts, Objects Relationships, planning objects, confirm the active plan version, object characteristics. Commodity Management: SAP Commodity Procurement, SAP Commodity Sales, SAP Commodity Risk Management.	UNIT-III: Organizational Management Concepts: Organizational Management Concepts, Objects Relationships, planning objects, confirm the active plan version, object characteristics. Commodity Management: SAP Commodity Procurement, SAP Commodity Sales, SAP Commodity Risk Management.
	UNIT-IV: SAP Master Data: Master Data Introduction-Explore SAP ERP	UNIT-IV: SAP Master Data: Master Data Introduction-Explore SAP ERP

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	Basics Master Data, MDG Overview, Roadmap and Product Portfolio-Explore MDG Introduction Central Governance and Mass Processing-Describe the general concepts and capabilities of SAP MDG, central governance-Illustrate the scope of SAP MDG, central governance in the current versionUnderstand EIM Product Portfolio.	Basics Master Data, MDG Overview, Roadmap and Product Portfolio-Explore MDG Introduction Central Governance and Mass Processing-Describe the general concepts and capabilities of SAP MDG, central governance-Illustrate the scope of SAP MDG, central governance in the current versionUnderstand EIM Product Portfolio.
	UNIT-V: SAP Modules: FI/CO-Automatic Payments- Dunning Program- Correspondence- Basics of Parallel Accounting- Document Control- Posting Control- Clearing, HRM-Organization management – time management –payroll-ESS& MSS, SD-Enterprise Structures in sales and Distribution –Overview of sales Process-master data in sales and distribution. Relevant cases have to be discussed in each unit and in examination case is co	UNIT-V: SAP Modules: FI/CO-Automatic Payments- Dunning Program- Correspondence- Basics of Parallel Accounting- Document Control- Posting Control- Clearing, HRM-Organization management –time management –payroll-ESS& MSS, SD-Enterprise Structures in sales and Distribution –Overview of sales Process-master data in sales and distribution. Relevant cases have to be discussed in each unit and in examination case is co

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Syllabus revision Index (2021-22)

S.No	Name of the course	Percentage of syllabus change
1.	Lean Management.	20
2.	Data base Management System.	20

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LEAN MANAGEMENT

II Semester **L T P C**
Course Code: 194MB2O06 **4 0 0 4**

Course Objectives:

COB 1: To understand issues and challenges in implementing and development in lean manufacturing techniques from TPS and its contribution for improving organizational performance.
COB 2: To acquaint the students about various issues on quality improvement in the process of Production.

Course Outcomes:
At the end of the Course, Student will be able to:

CO 1 : Understand and apply the various types of new production systems.
CO 2 : Analyze and apply the suitable techniques to improve the quality in process of production.
CO 3 : Analyze and apply the standards in Lean system.
CO 4 : Apply the standardization of total productive maintenance.
CO 5 : Analyze and apply the Hoshin planning system.

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO 1 (K3)	PO 2 (K4)	PO 3 (K5)	PO 4 (K5)	PO 5 (K3)	PO 6 (K4)	PO 7 (K3)	PO 8 (K3)	PO 9 (K3)	PO 10 (K3)	PO11 (K4)
CO1 (K3)	3	-	2	-	-	-	-	-	-	-	-
CO2 (K4)	-	-	-	2	3	-	-	-	-	-	-
CO3 (K3)	-	-	3	-	-	-	-	-	-	-	2
CO4 (K3)			2		-	-	-	-	-	-	2
CO5 (K3)	-	-		2	-	-	-	-	3	-	-

Mapping of Course Outcomes with Program Specific Outcomes

CO / PSO	PSO 1(K3)	PSO 2(K4)	PSO 3(K4)
CO1 (K3)	3	-	-
CO2 (K4)	2	-	-
CO3 (K3)	3	-	-
CO4 (K3)	3	-	-
CO5 (K3)	3	-	-

UNIT- I:
Introduction: Mass production system, Craft Production, Origin of Lean production system, Why Lean production, Lean revolution in Toyota, Systems and systems thinking, Basic image of lean production, Customer focus, Waste Management.

UNIT- II:
Just In Time: Why JIT, Basic Principles of JIT, JIT system, Kanban, Six Kanban rules, Expanded role of conveyance, Production leveling, Three types of Pull systems, Value stream mapping. JIDOKA, Development of Jidoka concept, Why Jidoka, Poka, Yoke systems, Inspection systems and zone control – Types and use of Poka-Yoke systems, Implementation of Jidoka.

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DATA BASE MANAGEMENT SYSTEM

II Semester **L T P C**
Course Code: 194MB2O07 **4 0 0 4**

Course Objectives:

COB 1: To emphasis on DBMS and how to organize, maintain and retrieve efficiently, and effectively - information from a DBMS.
COB 2: To make students able to understand and apply the DBMS tools and techniques effectively.

Course Outcomes:
At the end of the Course, Student will be able to:

CO 1: Understand and apply the data models of DBMS.
CO 2: Analyze and apply the ER and Relational models.
CO 3: Understand and Apply the Data Definition and Querying,
CO 4: Understand and Apply the Transactions and Concurrency.
CO 5: Understand and Apply the Advanced Topics in Databases.

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO 1 (K3)	PO 2 (K4)	PO 3 (K5)	PO 4 (K5)	PO 5 (K3)	PO 6 (K4)	PO 7 (K3)	PO 8 (K3)	PO 9 (K3)	PO 10 (K3)	PO11 (K4)
CO1 (K3)	3	-	2	-	-	-	-	-	-	-	-
CO2 (K4)	2	-	-	3	3	-	-	-	-	-	-
CO3 (K3)	3	-	3	-	-	-	-	-	-	-	2
CO4 (K3)	3		2		-	-	-	-	-	-	2
CO5 (K3)	3	-	-	2	-	-	-	-	3	-	-

Mapping of Course Outcomes with Program Specific Outcomes

CO / PSO	PSO 1(K3)	PSO 2(K4)	PSO 3(K4)
CO1 (K3)	3	-	-
CO2 (K4)	2	-	-
CO3 (K3)	3	-	-
CO4 (K3)	3	-	-
CO5 (K3)	3	-	-

UNIT- I:
Introduction to Database Systems: Data - Database Applications - Evolution of Database - Need for Database Management – Data models - Database Architecture - Key Issues and Challenges in Database Systems.

UNIT -II:
ER and Relational Models: ER Models – ER to Relational Mapping –Object Relational Mapping – Relational Model Constraints - Keys - Dependencies - Relational Algebra - Normalization - First, Second, Third & Fourth Normal Forms - BCNF – Join Dependencies.

UNIT- III:
Data Definition and Querying: Basic DDL - Introduction to SQL - Data Constraints - Advanced SQL – Views - Triggers - Database Security – Embedded & Dynamic SQL.

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1.1.2. Table-Prior/Post revision of syllabus(2021-22)

Regulation	Pre-Revision	Post-Revision
Course Title	Lean Management.	Lean Management.
Course Code	194MB2O06	194MB2O06
Syllabus	UNIT- I: Introduction: Mass production system, Craft Production, Origin of Lean production system, Why Lean production, Lean revolution in Toyota, Systems and systems thinking, Basic image of lean production, Customer focus, Waste Management.	UNIT- I: Introduction: Mass production system, Craft Production, Origin of Lean production system, Why Lean production, Lean revolution in Toyota, Systems and systems thinking, Basic image of lean production, Customer focus, Waste Management.
	UNIT- II: Just In Time: Why JIT, Basic Principles of JIT, JIT system, Kanban, Six Kanban rules, Expanded role of conveyance, Production leveling, Three types of Pull systems, Value stream mapping. JIDOKA, Development of Jidoka concept, Why Jidoka, Poka, Yoke systems, Inspection systems and zone control – Types and use of Poka-Yoke systems, Implementation of Jidoka	UNIT- II: Just In Time: Why JIT, Basic Principles of JIT, JIT system, Kanban, Six Kanban rules, Expanded role of conveyance, Production leveling, Three types of Pull systems, Value stream mapping. JIDOKA, Development of Jidoka concept, Why Jidoka, Poka, Yoke systems, Inspection systems and zone control – Types and use of Poka-Yoke systems, Implementation of Jidoka
	UNIT -III: Kaizen: Six – Sigma philosophy and Methodologies, QFD, FMEA Robust Design concepts; SPC, QC circles standardized work in lean system, Standards in the lean system, 5S system.	UNIT -III: Kaizen: Six – Sigma philosophy and Methodologies, QFD, FMEA Robust Design concepts; SPC, QC circles standardized work in lean system, Standards in the lean system, 5S system.
	UNIT- IV: Total Productive Maintenance: Why Standardized work, Elements of standardized work, Charts to define standardized work, Kaizen and Standardized work Common layouts.	UNIT IV PROJECT SELECTION FOR LEAN Resource and project selection, Selecting projects, Process mapping, Current and future value stream mapping, project suitable for lean initiatives.
	UNIT- V: Hoshin Planning & Lean	UNIT- V: Hoshin Planning & Lean

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1.1.2. Table-Prior/Post revision of syllabus (2021-22)

Regulation	Pre-Revision	Post-Revision
Course Title	Data base Management System	Data base Management System
Course Code	194MB2O07	194MB2O07
Syllabus	UNIT- I: Introduction to Database Systems: Data - Database Applications - Evolution of Database - Need for Database Management – Data models - Database Architecture - Key Issues and Challenges in Database Systems. .	UNIT- I: Introduction to Database Systems: Data - Database Applications - Evolution of Database - Need for Database Management – Data models - Database Architecture - Key Issues and Challenges in Database Systems.
	UNIT -II: ER and Relational Models: ER Models – ER to Relational Mapping –Object Relational Mapping – Relational Model Constraints - Keys - Dependencies - Relational Algebra - Normalization - First, Second, Third & Fourth Normal Forms - BCNF – Join Dependencies.	UNIT -II: ER and Relational Models: ER Models – ER to Relational Mapping Introduction to Protocols for Concurrency Control in Databases : Two-Phase Locking Techniques for Concurrency Control-Types of Locks and System Lock Tables.
	UNIT- III: Data Definition and Querying: Basic DDL - Introduction to SQL - Data Constraints - Advanced SQL – Views - Triggers - Database Security – Embedded & Dynamic SQL	UNIT- III: Data Definition and Querying: Basic DDL - Introduction to SQL - Data Constraints - Advanced SQL – Views - Triggers - Database Security – Embedded & Dynamic SQL
	UNIT -IV: Transactions and Concurrency: Introduction to Transactions - Transaction Systems - ACID Properties – System & Media Recovery - Need for Concurrency - Locking Protocols – SQL for Concurrency – Log Based Recovery - Two Phase Commit Protocol - Recovery with SQLDeadlocks &	UNIT -IV: Transactions and Concurrency: Introduction to Transactions - Transaction Systems - ACID Properties – System & Media Recovery - Need for Concurrency - Locking Protocols – SQL for Concurrency – Log Based Recovery - Two Phase Commit Protocol - Recovery with SQLDeadlocks & Managing

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