KURUKSHETRA UNIVERSITY KURUKSHETRA

SCHEME OF STUDIES/EXAMINATIONS

Bachelor of Technology (Electrical Engineering)

Semester – V (w.e.f. session 2017-2018)

S. N.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hrs/ Wk	Theory	Sessional	Practical	Total	
1	EE-301N	Power Electronics-I	4	1		5	75	25		100	3
2	EE-303N	Electronic Instrumentation & Measurement	4	1		5	75	25		100	3
3	EE-305N	Non-Conventional Energy Resources	3			3	75	25		100	3
4	EE-307N	Control System	4	1		5	75	25		100	3
5	EE-309N	Power Transmission & Distribution	4	1		5	75	25		100	3
6*****	**EEN-311N**	Field & Waves	4	1		5	75	25		100	3
7	EE-313N	Control System Lab			2	2		40	60	100	3
8	EE-315N	Power Electronics Lab			2	2		40	60	100	3
9	EE-317N	Electronic Instrumentation Lab			2	2		40	60	100	3
10	EE-319N	Industrial Training-I	1			1		100		100	
		Total	**24**	**5**	**6**	**35**	**450**	**370**	**180**	**1000**	

Note: 1. ***** Subject Common with V Semester. B.Tech. [Electrical & Electronics Engg.] Scheme, K.U.K.
2. Industrial Training undergone by the students after IV sem is to be evaluated during V sem as **(EE-319N)** through submission of certified computerized report to the H.O.D. followed by conduct of viva-voce & seminar/presentation.

Semester – VI (w.e.f. session 2017-2018)

S. N.	Course No.	Course title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hrs/ Wk	Theory	Sessional	Practical	Total	
1	EE-302N	Power Electronics-II	3	1		4	75	25		100	3
2	EE-304N	Micro Processor & Interfacing	4	1		5	75	25		100	3
3	EE-306N	Power System Analysis & Protection	4	1		5	75	25		100	3
4	EE-308N	Electrical Machine Design	3	1		4	75	25		100	3
5	EE-310N	Electric Drives & Traction	4	0		4	75	25		100	3
6******	**EEN-312N**	Digital Signal Processing	4	1		5	75	25		100	3
7******	**EEN-314N**	Digital Signal Processing Lab			2	2		40	60	100	3
8	EE-316N	Power System Lab			2	2		40	60	100	3
9	EE-318N	Micro Processor & Interfacing Lab			2	2		40	60	100	3
10	EE-320N	Electric Drives Lab			2	2		40	60	100	3
		Grand Total	**22**	**5**	**8**	**35**	**450**	**310**	**240**	**1000**	

Note: 1. ****** Subjects Common with VI Semester. B.Tech. [Electrical & Electronics Engg.] Scheme, K.U.K.
2. The students will have to undergo another six weeks Industrial Training after VI sem and it will be evaluated during VII sem through submission of certified computerized report to the H.O.D. followed by conduct of viva-voce & seminar/presentation.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-301N	**POWER ELECTRONICS- I**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Power Diodes: depletion region, barrier potential, effect of forward & reverse bias, V-I characteristics, types of power diode, special features of power diode, power diode ratings, applications

Power Transistors: Introduction, Bipolar junction transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations, applications of power BJT.

UNIT-II

Thyristor , Construction, principal of operation , characteristics of Thyristor: Thyristor turn on methods gate control, trigger voltage, trigger current, turn on process, conduction, turn off process ,turn on and turn off times Thyristor specifications and ratings, methods to improve *di/dt* and *dv/dt* ratings,

DIAC, TRIAC, UJT: Ratings, Construction, principle of operation. Characteristics & applications

UNIT-III

SCR Triggering Circuits: Resistance triggering, R-C triggering, UJT triggering, triac triggering, pulse transformer triggering Thyristor in series, in parallel, snubber circuit.

SCR Commutation: methods, commutating circuits, protection.

Thyristor family RCT, GTO, LASCR, MCT, PUT, SUS, SBS, SCS

UNIT-IV

Convertors (Rectifiers): One, two, three, six and twelve pulse converters, fully and half controlled converters, load voltage waveforms, output voltage equation, continuous and discontinuous modes of operation, input power factor of converter, reactive power demand effect of source inductance, introduction to four quadrant/ dual converter, power factor improvement techniques, forced commutated converter, MOSFET and transistor based converters.

TEXT BOOKS/REFERENCES:

1. Power Electronics: P.S Bhimra, Khanna Publication.
2. Power Electronics - Circuits, Devices and Applications, M. H . Rashid P.H .I. Publications.
3. Power Electronics: PC Sen; TMH.
4. Power Electronics by Dr. B. R. Gupta, Katson Publishers.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-303N	**Electronic Instrumentation & Measurement**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT - I

C.R.O: Introduction, basic specifications of CRO, Cathode Ray Tube (CRT), Electron Gun, Electrostatic Focussing, Electrostatic Deflection, limitation, Applications, sampling oscilloscope, analog and storage C.R.O, DSO, comparison between analog and digital storage oscilloscope.

Instruments for Signals Generation: Square wave and pulse wave circuits, multi-vibrators, function Generators, frequency synthesizer.

Elementary idea of Bio-medical Measurement: ECG, EEG, Blood pressure measurement.

UNIT-II

Signal Conditioning & Acquisition System: Signal conditioning, DC & AC signal conditioning A/D converter, D/A converter, basic components of analog and digital data acquisition system.

Transducer: Definition of transducer. Advantages of an electrical signal as out-put. Basic specifications of transducers, Primary and Secondary Transducers, Analog and digital types of transducers. Resistive, inductive, capacitive, piezoelectric, and photoelectric and Hall effect transducers.

Measurement of Displacement - Potentiometric resistance type transducers, inductive type transducers, differential transformer (L.V.D.T), capacitive transducers, Hall Effect devices, strain gauge transducers.

UNIT - III

Measurement of Velocity - Variable reluctance pick up, electromagnetic tachometers, photoelectric tachometer, toothed rotor tachometer generator.

Measurement of Flow: Venturi meter, electromagnetic flow meter.

Measurement of Pressure - Manometers, Force summing devices.

Measurement of Force - Strain-gauge load cells, pneumatic load cell, L.V.D.T. type force transducer.

UNIT – IV

Measurement of Torque - Torque meter, torsion meter, absorption dynamometers, inductive torque transducer and digital methods

Measurement of Temperature - Metallic resistance thermometers, semi- conductor resistance sensors(Thermistors), thermo-electric sensors, pyrometers.

Measurement of Liquid Level: Resistive Method, Inductive method, capacitive method.

Sound Measurement: Microphone, Types of Microphones.

Measurement of Humidity: Resistive, capacitive, aluminium oxide & crystal hygrometers.

Suggested Books:

1. B.C. Nakra, K.K. Chaudhry, "Instrumentation Measurement and Analysis," . Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Thomas G. Beckwith etc. all, "Mechanical Measurements (International Student Edition), Addison-Wesley Longman, Inc. England.
3. A.K. Sawhney, " A Course in Electrical and Electronic Measurements and Instrumentation," Dhanpat Rai & Sons, Delhi-6.
4. A.K. Sawhney, " A Course in Mechanical Measurements," Dhanpat Rai & Sons.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-305N	**Non-Conventional Energy Resources**	**3**		**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Unit I

SOLAR ENERGY: Introduction to Solar Radiation and its measurement. Solar Energy Collectors & Storage, Flat plate collectors, liquid and air type. Theory of flat plate collectors, advanced collectors, optical design of concentrators, solar water heating, solar dryers, solar stills, solar cooling and refrigeration. Thermal storage.

APPLICATIONS OF SOLAR ENERGY: Solar Thermal Electric Conversion, Thermal Electric Conversion Systems, Solar Electric power Generation, Solar Photo-Voltaics, Solar Cell Principle, Semiconductor Junctions, Conversion efficiency and power output, Basic Photo Voltaic System for Power Generation.

Unit II

WIND ENERGY: Characteristics of wind, wind data. Horizontal & Vertical axis wind Mills, Wind Energy Extraction, Wind Characteristics, Power Density Duration Curve, Design of Wind Turbine Rotor, Design of Regulating System for Rotor, Wind Power Generation Curve, Sub-systems of a Horizontal Axis Wind Turbine Generator, Modes of Wind Power Generation, Estimation of Wind Energy Potential, Selection of Optimum Wind Energy Generator (WEG), Grid Interfacing of a Wind Farm, Methods of Grid Connection, Grid System and Properties, Capacity of Wind Farms for Penetration into Grid, Control System for Wind Farms, Economics of Wind Farms.

Unit III (Qualitative analysis only)

GEOTHERMAL ENERGY: Structure of the Earth's Interior, Plate Tectonic Theory, Geothermal Sites, Geothermal Field, Geothermal Gradients, Geothermal Resources, Geothermal Power Generation, Geothermal Electric Power Plant, Geothermal-Preheat Hybrid with Conventional Plant.

OCEAN ENERGY: Development of a Tidal Power Scheme, Grid Interfacing of Tidal Power, Wave Energy, Mathematical Analysis of Wave Energy, Empirical Formulae on Wave Energy, Wave Energy Conversion, Principle of Wave Energy plant, Wave Energy Conversion Machines.

FUEL CELLS: Principle of Operation of Fuel Cell, Fuel Processor, Fuel Cell Types, Energy Output of a Fuel Cell, Efficiency, and EMF of a Fuel Cell, Operating Characteristics of Fuel Cells, Thermal Efficiency of a Fuel Cell.

Unit IV (Qualitative analysis only)

BIOMASS ENERGY: Introduction to biomass, biofuels & their heat content, Brief overview about biomass conversion technologies, Biochemical conversion and Biogas technologies. Factors affecting biogas production, biogas plants- types & description. Utilization of biogas - Gasifiers, direct thermal application of Gasifiers. Advantages & problems in development of Gasifiers, use in I.C. engines, Energy plantation. Pyrolysis scheme. Alternative liquid fuels –ethanol and methanol.

HYBRID ENERGY SYSTEMS: Hybrid Systems and its types. Concept of Electric and Hybrid Electric Vehicles.

References:

1. Kothari, Singal and Ranjan , Renewable Energy Sources and Emerging Technologies,2nd ed, Prentice Hall (India).
2. G.D. Rai, Non-Conventional Sources of Energy, Khanna Publishers.
3. B H Khan, Non-Conventional Energy Resources, McGraw Hill Education.
4. Bansal N.K., M. Kleemann, M. Heliss, Renewable energy sources and conversion technology, TMGH 1990.
5. Abbasi SA, Abbasi N, Renewable energy sources andtheir environmental impact, PHI, 2001
6. Mittal KM, Renewable energy Systems, Wheelar Publishing, New Delhi, 1997.
7. Mukherjee D, Renewable energy Systems, New Age International, New Delhi, 2004
8. Renewable Energy Resources: John Twidell and Tony Weir.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-307N	**Control System**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Control Systems: Basics & Components: Introduction to basic terms, classifications & types of Control Systems, block diagrams & signal flow graphs, Mathematical Models of Physical System, Differential equation of physical systems & electrical systems with analogy. Transfer function, determination of transfer function using block diagram reduction techniques and Mason's Gain formula. Error detectors, Signal conditioners, Modulators, Demodulators, Servo amplifiers voltage and power, Actuators including servomotors, Techogenerators, Stepper motor.

UNIT II

Time–Domain Analysis :Time domain analysis, transient response of first & second order systems ,steady state error and static error constants in unity feedback control systems, response with P, PI and PID controllers, limitations of time domain analysis.

UNIT III

Frequency Domain Analysis and Stability : Concept of stability, graphic and numeric techniques of stability analysis, Routh Hurwitz, Nyquist, Bode plot, Root locii and polar plots, frequency domain specifications and performance of LTI systems, Gain and phase margins, relative stability. Correlation with time domain performance closed loop frequency responses from open loop response. Limitations of frequency domain analysis.

UNIT IV

State Space & Compensation Techniques: State space characteristics of control systems. Concepts of state variable, Transfer Function controllability and observability. Concepts of compensation, series/parallel/ series-parallel/feedback compensation, Lag/Lead/Lag-Lead networks for compensation.

References :

1. Control System Engg. By Nagrath and Gopal.
2. Control System Engg. By K.Ogata.
3. Liner Control System by R.S. Chauhan, (Umesh Publications)
4. Feedback control system Analysis and Synthesis by D'Azzo and Houpias.
5. Control System by B.C. Kuo.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-309N	**Power Transmission & Distribution**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT- I

Transmission of Power by A.C. & D.C. system: Typical power system, Modern trends in power system transmission . Underground and overhead system, Effects of increase in Voltage on transmission line efficiency

Distribution of Power: General consideration, Radial and ring main system. Different types of distributors; Relative copper consumption in various systems. Conductor size and Kelvin's Law, Tariffs and power factor improvement.

UNIT- II

Resistance of transmission lines, skin effects, Proximity effect,

Inductance of a single phase & two phase line, Composite conductor lines, Three phase lines with symmetrical and unsymmetrical spacing, , Bundled conductors

Capacitance of two-wire line, three phase line with symmetrical and unsymmetrical spacing, Effect of earth capacitance.

UNIT- III

PERFORMANCE OF LINES Short, medium and long lines – their representation, Performance calculation, determination of ABCD parameters, Ferranti effect, Surge impedance Loading of transmission lines, , Calculation of synchronous phase modifier capacity.

Corona loss & radio interference Factors affecting corona , advantages and disadvantages of corona, disruptive critical voltage, visual critical voltage, corona power loss, methods of reducing corona effects, advantages & disadvantages of corona, interference of power lines with neighboring communication lines.

UNIT IV

Underground cables, Cables for A.C & D.C systems, Insulation resistance and capacitance, capacitance measurement, cable loss, Power factor in cable. Heating of cables Thermal characteristics, Use of inter sheaths, Capacitance grading.

Mechanical Considerations Types of Insulators, Methods of equalizing voltage distribution, Line supports, various types of conductor material, Sag calculations, Effect of wind, Ice and temperature on sag, Conditions at erection.

Text Books/References:

1. Power System analysis and Stability by S.S. Vadhera
2. Electrical Power System by C.L. Wadhwa
3. Electrical Power System by Ashfaq Hussain
4. Elements of Power System Analysis by W.D. Stevenson
5. Electric Power System by B.M. Weddy
6. The transmission and Distribution of Electric energy by H. Cotton
7. Modern Power System Analysis by I.J. Nagrath and D.P. Kothari
8. A Course in Electrical Power by Soni, Gupta and Bhatnagar

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-311N	**Field & Waves**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT – 1

Review of vector algebra, the three orthogonal co-ordinate systems and their inter-relation, review of vector calculus in all the three coordinate systems: Line, surface & volume integrals, gradient, divergence & curl of vector & their physical significance, Divergence theorem, stokes theorem, concept of soleniodal and irrotational fields.

Gauss Law in electrostatics & its applications, uniform line, surface & volume charge distributions, concept of electric field & electric potentials, electric field & potential due to a linear dipole, Spherical & cylindrical capacitor, energy density in electric field, method of images.

UNIT-II

Magnetostatics: Magnetic flux density and magnetizing field intensity, Biot Savart's law, Amperes circuital law & its applications. Magnetic vector potentials, Magnetic field energy, boundary conditions for both the electric & magnetic fields at the interface of various types of media. Laplace, Poisson's equation & continuity equation, displacement current density, conduction current density, Maxwell's equation in differential & integral forms, time harmonic cases & their physical significance, retarded potentials.

UNIT- III

UPW: Plane waves & uniform plane waves and their properties , wave equations in various media, Polarization & its types, intrinsic impedance, propagation constant, reflection & refraction of uniform plane waves at the interface of conductor- dielectric & dielectric-dielectric (both normal and oblique incidence). Relaxation time, skin effect, skin depth & surface impedance, Poynting vector theorem and its physical significance.

UNIT- IV

Transmission lines: Distributed parameters, circuit parameters, concepts of voltage & current flow on a transmission line, line equations, characteristics impedance. Reflection of transmission line, maxima & minima, standing wave ratio of a transmission line, impedance matching, Smith's chart & its applications, co-axial type transmission line.

Wave Guides: Brief idea of Wave Guides, types of Wave Guides. TE, TM and TEM modes in rectangular wave guides.

Reference Books:

1. Field & Waves Electromagnetic by D.K. Cheng. (Pearson Education)
2. Electromagnetic Fields & Wave by Sadiku (Oxford Univ. Press)
3. Electromagnetic by J.D. Kraus, MGH.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EE-313N	**Control System Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS:

1. Experiment to study linear system simulator.
2. To study the stroboscope & measure the shaft speed
2. Experiment to study light intensity control using P & PI controller with provision for and transient speed control.
3. Experiment to study D.C motor speed control.
4. Experiment to study the stepper motor characteristics and its control through microprocessor kit.
5. Experiment to study Temperature control system.
6. Experiment to study Compensation design.
7. Experiment to study Digital control system.
8. Experiment to study synchros.
10. Experiment to study AC Position control system.
11. Experiment to study Potential Metric Error detector.

NOTE: 10 experiments are to be performed with at least 8 from above list; the remaining may either be performed or designed & set by concerned Institution as per the scope.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EE-315N	**Power Electronics Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS:

1. Experiment to study characteristics of diode, Thyristor and Triac.
2. Experiment to study characteristics of Transistor and MOSFET.
3. Experiment to study R and R-C firing circuits
4. Experiment to study UJT firing circuit.
5. Experiment to study complementary voltage commutation using a lamp flasher.
6. Experiment to study Thyristorised D.C circuit breaker.
7. Experiment to study Thyristorised A.C phase control.
8. Experiment to study full wave converter.
9. Experiment to study series inverter.
10. Experiment to study DC chopper.
11. Experiment to study of bridge inverter.
12. Experiment to study of single phase cycloconvertor.

NOTE: At least 10 experiments are to be performed with 8 from above list; the remaining may either be performed or designed & set by concerned Institution as per the scope

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EE-317N	**Electronic Instrumentation Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS:

1. To Measure Temperature using RTD.
2. To Measure Displacement using L.V.D.T.
3. To Measure Load using Load Cell.
5. To Light intensity Measurement using LDR & Photo Cell.
6. To Measure Angular Displacement using Capacitive Transducer.
7. To Measure the Variation in Water Level using Capacitive Transducer
8 Experiment to measure temperature coefficient of material using thermo couple
9 Experiment to measure pressure using strain gauge
10 Experiment to study Op-Amp as instrumentation amplifier.
11 Experiment to study Op-Amp as AD/DA converter
12 Experiment to measure the speed of D.C motor using magnetic pick-up.
13 Experiment to measure the speed of D.C motor using Photo-electric pick-up.
14 To study Q-meter for measurement of resistance, inductance and capacitance.

NOTE: At least 10 experiments are to be performed with 8 from above list, the remaining may either be performed or designed & set by concerned Institution as per the scope.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-302N	**Power Electronics-II**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Unit -I

D.C. to D.C. Converter: Choppers

Classification of choppers, principle of operation, steady state analysis of class A choppers, step up chopper, steady state, switching mode regulator: buck, boost, buck-boost, cuk regulators, current commutated and voltage communicated chopper, basic scheme, output voltage control techniques, one, two and four quadrant choppers, step up chopper, voltage commutated chopper, current commutated chopper, MOSFET and transistor based choppers.

Unit-II

D.C. to A.C. Converter:

Classification, basic series and improved series inverter, parallel inverter, single phase voltage source inverter, steady state analysis, half bridge and full bridge inverter: modified Mc Murray and modified Mc Murray Bedford inverter, voltage control in single phase inverters, PWM inverters reduction of harmonics, current source, three phase bridge inverter.

Inverters:

Basic circuit, 120 degree mode and 180 degree mode conduction schemes, modified McMurray-Bedford half bridge and bridge inverters, brief description of parallel and series inverter (CSI), transistor and MOSFET based inverters

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Unit-III

A.C. to A.C CONVERTER:

Cycloconvertor

Basic principles of frequency conversion, types of cycloconverters, non-circulating and circulating types of cycloconverters.Classification, principle of operation of step up and step down cycloconverter, single phase to single phase cycloconverter with resistive and inductive load. Three phase to three phase cycloconverter. Output voltage equation of cycloconverter.

Unit-IV

Applications of Power Electronics. (Brief descriptions):

Switched mode power supplies**,** AC Regulators **,** UPS ,static switches ,solid state relays, static circuit breakers A.C. Regulators, electric welding ,electric heating, battery charging, illumination control ,FACTs devices, zero voltage switch, over voltage protection, HVDC System

Text Books:

1. M.H. Rashid, Power Electronics: Circuits Devices and Application, PHI
2. Ned Mohan, Tore m. undeland, William P. Robbins, Power Electronics: Converters, Application and Design, John Wiley & Sons.
3. P.S. Bhimra, Power Electronics.
4. M.Ramamoorthy an introduction to Thyristors & their applications East West Press.
5. A.K. Gupta & L.P. Singh, Power electronics and introduction to Drives Dhanpat Rai Pub. Co.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-304N	**Microprocessor & Interfacing**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

INTRODUCTION: Evaluation of microprocessors, technological trends in microprocessor development. The Intel family tree, CISC Versus RISC, Applications of Microprocessors.

8086 CPU ARCHITECHTURE: 8086 Block diagram; description of data registers, address registers; pointer and index registers, PSW, Queue, BIU and EU. 8086 Pin diagram descriptions, Generating 8086 CLK and reset signals using 8284. WAIT state generation, microprocessor BUS types and buffering techniques, 8086 minimum mode and maximum mode CPU module.

UNIT – II

8086 INSTRUCTION SET: Instruction formats, addressing modes, Data transfer instructions, string instructions, logical instructions, arithmetic instructions, transfer of control instructions; process control instructions; Assembler directives.

8086 PROGRAMMING TECHNIQUES: Writing assembly language programs for logical processing, arithmetic processing, timing delays; loops, data conversions, writing procedures: data tables, modular programming and macros.

UNIT – III

MIAN MEMORY SYSTEM DESIGN: Memory devices, 8086 CPU Read/Write timing diagrams in minimum mode and maximum mode. Address decoding techniques. Interfacing SRAMS; ROMS/PROMS. Interfacing and refreshing DRAMS. DRAM Controller – TMS4500.

UNIT – IV

BASIC I/O INTERFACE: Parallel and Serial I/O Port design and address decoding, Memory mapped I/O Vs Isolated I/O Intel's 8255 and 8251 – description and interfacing with 8086. ADCs and DACs, -types, operation and interfacing with 8086. Interfacing keywords, alphanumeric displays, multiplexed displays and high power devices with 8086.

INTERRUPT & DMA: Interrupt driven I/O. 8086 interrupt mechanism; interrupt types and interrupt vector table. Intel's 8259. DMA operation. Intel's 8237. Microcomputer video displays.

Suggested Books:

1. D.V.Hall, Microprocessors and interfacing, McGraw Hill 2nd Edition.
2. J Uffenbeck, The 8086/8088 family, PHI.
3. liu, Gibson, Microcomputer Systems- The 8086/8088 family, (2nd ed- PHI).

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-306N	**Power System Analysis & Protection**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Introduction Characteristics & representation of components of a power system, synchronous machines, transformers, lines cables & loads. Single line diagram of a power system Flow of zero sequence current , zero sequence impedance diagrams of power system with different types of connections of three phase transformers

Neutral grounding need for neutral grounding, various types of neutral grounding

Flow of zero sequence current, zero sequence impedance diagrams of power system with different types of connections of three phase transformers

UNIT-II

Circuit Interruption : Circuit interruption, theory of arc formation and it's excitation in d.c., a.c. circuits, restriking & recovery voltage, interruption of capacitive & inductive currents. Rupturing capacity & rating of circuit breakers.

Circuit-Breakers : Classification of circuit-breakers, circuit-breakers of low medium, high & extra high voltages. Multibreak & resistance switching. Auto-restoring of high capacity & H.V. circuit breakers.

UNIT-III

Symmetrical faults: calculation of fault currents, use of current limiting reactors. **Unsymmetrical faults**: Types of transformation in power system analysis, symmetrical components transformation, sequence impedance of power system elements, Sequence network of power system analysis of unsymmetrical short faults , Network analysis & it's application to interconnected system.

UNIT-IV

`Protective System features of good protective system, elements of relay, terms connected with relay,time grading of over current protection., differential relay, distance or impedence relay, static relays (elementary idea)

Protection of alternators, transformer, bus-bar, lines

Reference Books:

1. Elements of Power System Analysis by W.D. Stevenson.
2. Electric Power System by B.M. Weddy.
3. The transmission & Distribution of Electric Energy by H. Cotton.
4. Power System & Protection by S.S. VADHERA
5. Electrical Power System by C.L. Wadhwa
6. Electrical Power System by Ashfaq,Hussain
7. Power System Protection & Switchgear,Ravinder Nath,New Age
8. Power System Protection & Switchgear,Badri Ram,MGH
9. Protection & Switchgear, Bhalja, Maheshwari,Oxford

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-308N	**Electrical Machines Design**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

GENERAL: General features , limitations of electrical machine design, specific loadings **thermal design** types of enclosures, ventilation, heat dissipation, temperature rise, heating & cooling cycles, rating of machines, cooling media used, advantages of hydrogen cooling, effect of size and ventilation.

DC MACHINES: Main parts ,Output equation, choice of specific loadings, choice of poles and speed, Design of core length, armature diameter, depth of armature core ,air gap length, cross section of armature conductors, armature slots ,**design of field system** field poles, field coils, commutater.

UNIT II

TRANSFORMERS: Main parts of transformer, Standard specifications, output equation, voltage per turn , optimum design, design of core , design of winding, simplified steps for transformer design, tank and Cooling tubes, **Operating calculations** circuit parameters, magnetizing current, losses and efficiency, Temperature rise and regulations from design data.

SYNCHRONOUS MACHINES: Types of construction, types of synchronous alternators Specifications, output equation , **design of salient pole machines** main dimensions, short circuit ratio , length of air gap, choice of armature slots, turns per phase, conductor section , **design difference between turbo alternator & salient pole generators**, , direct & indirect cooling.

UNIT III

INDUCTION MOTORS:
Three Phase Induction Motor: Standard specifications, output equations, choice of specific loadings, main dimensions, conductor size and turns, no. of slots, slot design, stator core depth, **rotor design**, rotor bars& slots area, end rings .
SINGLE PHASE INDUCTION MOTOR: output equations, specific loadings, main dimensions, design of main and auxiliary winding, capacitor design, equivalent circuit parameters, torque, efficiency.

UNIT IV

COMPUTER AIDED DESIGN: Computerization of design procedures, development of computer programs & performance predictions, optimization techniques & their application to design problems.

TEXT BOOKS/REFERENCES:

1. Electrical Machine Design by A. K. Sawhney Dhanpat Rai & co.
2. M.G.Say, Performance and design of ac machines, CBS Publishers.
3. S.K. Sen., Principles of Electrical Machine Design with Computer Programs, Oxford and IBH.
4. A.E.Clayton, Hencock: Performance and design of dc machines, CBS Publishers.
5. J.H. Kuhlmann, Design of electrical operators, John Willey, 1957 .
6. CG Veinott, Theory and design of small induction machines, MGH, 1959
7. A Shanmugasundarem, Electrical machine design databook, John willey, 1979

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-310N	**Electric Drives & Traction**	**4**	**0**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Introduction: Definition & classification of different type of electric drives, its Review characteristics, choice of electric drive ,components of electric drives, advantages and applications.

Dynamics of Electric drives & Rating of motors: - Fundamental load torque equation, types of loads, frequency operation of motor subjected to intermittent loads, pulse loads etc. Determination of motor rating, Heating/cooling curve, Nature of loads and classes of motor duty.

Control of Electrical Drives: Modes of operation, closed loop control of drives, sensing of current and speed**.**

UNIT-II

D.C. drives: Various methods of braking of D.C. drives, Speed control methods of D.C. drives, 1-∅ fully controlled and half controlled rectifier fed separately excited D.C. motor, 3-∅ fully and half controlled fed separately excited D.C. Motor, Performance and characteristics of 1-∅ and 3-∅ rectifier controlled D.C. drives.

UNIT-III

AC Drives: Various methods of braking of A.C. drives, Speed control methods of A.C. drives, Basic principle of induction motor drives, 3 -∅ A.C. Voltage controller fed I.M drive, Drives using chopper, multi quadrant control of chopper fed motors, Synchronous motor Drives, Automatic starting and pulling operation of synchronous motors

UNIT-IV

Traction Drives: Nature of traction load, A.C. & D.C. motor drives in transportation system and traction & its characteristics, Duty cycle & speed time relationship, Polyphase A.C. motors for traction drives, D.C. traction using chopper controlled D.C. motors.

TEXT BOOKS:

1. Fundamentals of Electrical Drives, G.K.Dubey, Narosa Publishing House

REFERENCE BOOKS:

1. Power Semiconductor controlled drives, G.K.Dubey, Prentice Hall.
2. Electric Drives: V.Subrahmaniyam TMH
3. Electric Drives: Leonard, Narosa Pub.
4. Electric Drives: Diwan
5. Power Electonics : M.D.Singh, K.B.Knanchandani : Mc Graw Hill
6. Electric Motor Drives by Krishnan,PHI
7. Electric Drives: S.K.Pillai,New Age

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-312N	**Digital Signal Processing**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Introduction: Basic elements of DSP system, Advantages and disadvantage of DSP over analog processing, Application of Digital signal processing.

Z-Transform: Direct Z-Transform and importance of ROC, properties of Z-Transform, Inverse Z-transform methods, Rational Z-transform function representation, system function of LTI systems in Z-domain, one sided Z –Transform. Solution of difference equations. Analysis of LTI system in Z- domain, transient and steady- state response. Causality and stability. Pole- Zero Cancellations.

UNIT II

FREQUENCY TRANSFORMATIONS

Introduction to DFT, Direct Computation of DFT ,Properties of DFT, Circular Convolution , Fast fourier Transform(FFT),decimation in time ,decimation in frequency algorithm, Use of FFT in Linear Filtering , Goetzel Algorithm, Chirp-Z Transform algorithm.

UNIT III

Structure of Discrete-Time Systems: Structure for FIR Systems-direct form, Linear Phase, Cascade form, Frequency-Sampling structures, Structures for IIR- Direct, Cascade, Parallel & transposed structure, signal flow graphs .

Design for Digital Filters:- Symmetric and anti-symmetric FIR filters; Design of Linear Phase FIR using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency Sampling Method of FIR design, Impulse Invariance transformation, Bilinear transformation and its use in design of Butterworth and Chebyshev IIR Filters; Frequency transformation in Digital Domain, Matched Z-Transformation.

UNIT IV

Implementation of Discrete Time Systems:

Lattice, Ladder and Lattice-Ladder Structures, Shur- Cohn Stability test. Jury Test, Shur-Cohn-fuzzivera stability criterion for IIR filters, Discrete Hilbert Transform.

DSP processor architecture fundamentals: Study of ADSP and TMS series of processor architectures.

References:

1. Digital Signal Processing by J.G. Proakis and D.G. Manalakis-PHI
2. Digital Signal Processing by: A.V. Oppenheim and R.W. Schafer-PHI
3. Element of Digital Signal Processing by N. Sarkar Khanna Publishers.
4. Digital Signal Processing by S. K. Mitra –TMH.
5. Digital Signal Processing by Rabinar, Gold-PHI
6. Digital Signal Processing by S. Salivahanan- TMH
7. Digital Signal Processing by IFecher

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EEN-314N	**Digital Signal Processing Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS / PROGRAMS:

1. Write a program in MATLAB to study the basic operation on the discrete time signals. (Amplitude and time manipulation).
2. Write a MATLAB program to perform discrete convolution (linear and circular) for a given two sequences.
3. Write a MATLAB program to perform the DFT for a given sequence.
4. Write a MATLAB program to compute DFT and IDFT for a given sequence using FFT algorithem.
5. Write a MATLAB program to perform sampling rate conversion for any given arbitrary sequence by interpolation, decimation, upsampling, downsampling and resampling.
6. Write a MATLAB program to find the time domain response (Impulse response and phase response) for a given FIR and IIR systems.
7. Write a MATLAB program to find the frequency domain response (magnitude response and phase response) for a given FIR and IIR systems.
8. Write a MATLAB program to design a low pass filler using window method for the given specification.
9. Write a MATLAB program to design Butterworth and Chebyshev low pass filler using bilinear transformation and Impulse Invariant Transformation.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EE-316N	**Power System Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS

1. Experiment to find out the dielectric strength of transformer oil.
2 Experiment to find zero sequence component of three phase line.
3 Draw the characteristics of thermal overload relay.
4. Experiment to study an IDMT over current relay & plot it's characteristic curves i.e. graph between current & time.
5 Experiment to study differential relay characteristics.
6 Experiment to measure the ABCD parameters of a given transmission line, also study Ferranti effect.
7 Experiment to study Parallel operation of two alternators.
8 Experiment to plot the power angle characteristics of given transmission line.
9 Experiment to find the string efficiency of a string insulator with/without guard rings.
10 Experiment to study the characteristics of transmission line for t-network & pie- network.
11 Testing of a current transformer & find Ratio Error & Phase angle error for various burdens.
12 To study various types of distance relay.
13 Experiment to study fault current using sequence impedance network.

NOTE: At least 10 experiments are to be performed with at least 8 from above list, remaining 2 may either be performed from the above list or designed & set by concerned institution as per the scope.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EE-318N	**Micro-Processor & Interfacing Lab**	**2**	**40**	**60**	**100**	**3 Hr**

Before starting with the experiments, teacher should make the students conversant with the following theoretical concept:

A. i) Programming Modes of Intel's 8086.
   ii) Addressing Modes of Intel's 8086.
   iii) Instruction Formats of Intel's 8086.
B. Instruction Set of Intel's 8086.
C. Assembler and Debugger.

LIST OF EXPERIMENTS

I. a) Familiarization with 8086 Trainer Kit.
   b) Familiarization with Digital I/O, ADC and DAC Cards.
   c) Familiarization with Turbo Assembler and Debugger S/Ws.

II. Write a program to arrange block of data in

   a) Ascending and b) Descending order.

III. i) Program for finding largest number from an array. ii) Program for finding smallest number from an array.

IV. Write a program to find out any power of a number such that $Z = X^N$ Where N is programmable and X is unsigned number.

V. Write a program to measure to generate:

   (i) Sine Waveform (ii) Ramp Waveform (iii) Triangular Waveform using DAC Card.

VI. Write a program to measure frequency/Time period of the following functions:
   (i) Sine Waveform (ii) Square Waveform (iii) Triangular Waveform using DAC Card.

VII. Write a program to increase, decrease the speed of a stepper motor and reverse its direction of rotation using stepper motor controller card.

VIII. Write a programmable delay routine to cause a minimum delay = 2MS and a maximum delay = 20 minutes in the increments of 2MS.

IX. I) Use DOS interrupt to read keyboard string/character.
   ii) Use BIOS interrupt to send a string/character to printer.

X Write a program to :
   i) Create disk File
   ii) Open, write to and close a disk file
   iii) Open, Read from and close a disk file
   iv) Reading data stamp of a file using BIOS interrupt

XI i) Erasing UVPROMs and EPROM's
   ii) Reprogramming PROMs using computer compatible EPROM Programmer

XII Studying and Using 8086 In-Circuit Emulator.

XIII Write a Program to interface a two digit number using seven segment LEDs Using 8086 & 8255 PPI

Note: At least 10 experiments are to be performed, 8 from the above list, , remaining experiments may be performed depending upon the scope.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EE-320N	**Electric Drives Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS

1. Study of Industrial Applications of various mills.
2. Variable Torque Control of Induction Motor.
3. Breaking of DC Motor by using Mechanical & Electrical Methods.
4. Rotor resistance control of 3 phases Slip Ring Induction Motor.
5. Chopper Control of DC Motor.
6. Chopper Control of separately excited DC motor.
7. Study of different types of a loading on a particular load.
   (a) Intermediate Loading
   (b) Continuous Loading
8. Methods of starting Induction Motor.
9. Variable Voltage Control of Induction Motor.
10. Microprocessor Based Control of any Motor.
11. To study direct torque control of DC motor in MATLAB.

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution.

KURUKSHETRA UNIVERSITY KURUKSHETRA

SCHEME OF STUDIES/EXAMINATIONS

Bachelor of Technology (Electrical & Electronics Engineering)

V SEMESTER (w.e.f. 2017-2018)

SN	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs)
			L	T	P	Hr/ Wk	Theory	Sessional	Practical	Total	
1	EEN-301N	Power Quality & Management	3	1		4	75	25		100	3
2	EEN-303N	VLSI Design	3	1		4	75	25		100	3
3	EEN-305N	Power Electronics	4	1		5	75	25		100	3
4*	**EE-307N**	Control System	4	1		5	75	25		100	3
5*	**EE-309N**	Power Transmission & Distribution	4	1		5	75	25		100	3
6	EEN-311N	Field & Waves	4	1		5	75	25		100	3
7*	**EE-313N**	Control System Lab			2	2		40	60	100	3
8	EEN-315N	VHDL Lab			2	2		40	60	100	3
9	EEN-317N	Power Electronics Lab			2	2		40	60	100	3
10	EEN-319N	Industrial Training-I	1			1		100		100	
		Grand Total	**23**	**6**	**6**	**35**	**450**	**370**	**180**	**1000**	

Note: 1. ***** Subjects Common with V Semester. B.Tech. [Electrical Engg.] Scheme, K.U.K.

2. **Industrial Training** undergone by the students after IV sem is to be evaluated during V sem as **(EEN-319N)** through submission of certified computerized report to the H.O.D. followed by conduct of viva-voce & seminar/presentation.

VI SEMESTER (w.e.f. 2017-2018)

SN	Course No.	Course Title	Teaching Schedule				Allotment of Marks			Marks	Dur. of Exam (Hr)
			L	T	P	Hr/ Wk	Theory	Sessional	Practical		
1	EEN-302N	Power System Engineering	4	1		5	75	25		100	3
2	EEN-304N	Data Communication & Networking	4	0		4	75	25		100	3
3	EEN-306N	Micro Processor & Micro Controller	4	1		5	75	25		100	3
4******	**EE-308N**	Electrical Machine Design	3	1		4	75	25		100	3
5******	**EE-310N**	Electric Drives & Traction	4	0		4	75	25		100	3
6	EEN-312N	Digital Signal Processing	4	1		5	75	25		100	3
7	EEN-314N	Digital Signal Processing Lab			2	2		40	60	100	3
8	EEN-316N	Micro Processor Lab			2	2		40	60	100	3
9	EEN-318N	Power System Lab			2	2		40	60	100	3
10******	**EE-320N**	Electric Drives Lab			2	2		40	60	100	3
		TOTAL	**23**	**4**	**8**	**35**	**450**	**310**	**240**	**1000**	

Note: 1. ** Subjects Common with VI Semester. B.Tech. [Electrical Engg.] Scheme, K.U.K.

2. The students will have to undergo another six weeks Industrial Training after VI sem and it will be evaluated during VII sem through submission of certified computerized report to the H.O.D. followed by conduct of viva-voce & seminar/presentation.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-301N	**Power Quality & Management**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Unit – I: Power Quality Problems & Monitoring

Overview and Definitions of power quality, sources of pollution, international power quality standards, and regulations.

Unit – II: Power Quality Problems

Surges, voltage sag and swell, over voltage under voltage, outage voltage, and phase angle imbalance, electric noise, harmonics, frequency deviation monitoring.

Unit – III: Power System Harmonics

Harmonic analysis, harmonic sources – the static converters, transformer magnetization and non-linear machines, are furnaces, fluorescent lighting. Harmonic effect within the power system, interference with communication harmonic measurements.

Unit – IV:

Design, measure to minimize the frequency and duration of outages in distribution systems voltage regulators, harmonic filters, power conditioners, uninterruptible power suppliers, emergency and stand by power systems, application of power conditioners. Power distribution systems design, measure to minimize voltage disturbances.

Text Books:

1. N. G. Hingonani, Gyugi, Understanding FACTS concepts, Technology of flexible AC Transmission systems, IEEE Press, 1999

Reference Books:

1. T.J.E Milles , Reactive Power Control in Electric Systems, John Wiley & Sons 1982.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-303N	**VLSI Design**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Introduction: Monolithic Silicon Fabrication Technology: Crystal Growth, Vapour phase (CVDT Technique) and molecular beam epitaxy. Dry and wet Etching.

UNIT II

Diffusion & Oxidation: Oxide properties, oxidation kinetics, Oxidation process, diffusion Fick's law, dopant sources, Diffusion mechanism, Constant source & limited source diffusion, Characterization of diffused layers, Introduction to ion implantation.

UNIT III

Lithography & Metallization: Choice of metals, Vacuum evaporation, Sputtering Metalization problems, Lithography: Introduction to Photo, X-ray, electron beam lithography process, various printing techniques.

UNIT IV

Planer Technology: Fabrication process, Sequence for a BJT, Capacitor, resistor, IC, Environment for IC fabrication,. Assembly & packaging techniques.

Introduction to MOS Technology: Basic MOS transistors, NMOS & CMOS fabrication.

MOS Inverters: Pass Transistor, NMOS Inverter, CMOS Inverter, Latch up in CMOS circuits.

References:

1 K.R. Botkar: Integrated Circuits.
2 S.M. Sze: Micro Electronics.
3 Milliam Grabel : Mico Electronics
4 Pucknell : VLSI Design.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-305N	**Power Electronics**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Introduction: Characteristics of SCR, Diac, Triac and UJT. Protection of SCR against-over voltage, over current, *dv/dt, di/dt*, Heat sink design, Methods of commutation of SCR's, Series and Parallel operation of Thyristors.

UNIT II

AC to DC Converters: Classification of rectifiers, principle of working of each along with control circuits, Analysis of output voltage and current waveforms. Ripple factors, utility factor and efficiency, Effect of source and load inductance, Dual converter.

UNIT III

AC to AC Converters: Classification of Cycloconverters, principle of working along with control circuits, Analysis of output voltage and current waveforms, presence of sub-harmonic in cycloconverter output.

UNIT IV

DC to AC Converters: Classification of inverters, operation of each type, Analysis of voltage and current waveforms, current source inverter, voltage source inverter and pulse width modulated inverter.

DC to DC Converters: Classification of choppers, operating principle and control circuits for each type, Analysis of voltage and current waveforms.

References:

1. Thyrister Engineering by M.S. Brede.
2. Thyrister and their Application by M. Ramamurthy.
3. Thyrister Theory and Applications by Sugandhi and Sugandhi.
4. Principles of Inverter Circuits by B.D. Bedfred and R.G. Hoft.
5. Line Commutated Thyristor Converter by Gotifriend, Moltgen.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-307N	**Control System**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Control Systems: Basics & Components: Introduction to basic terms, classifications & types of Control Systems, block diagrams & signal flow graphs, Mathematical Models of Physical System, Differential equation of physical systems & electrical systems with analogy. Transfer function, determination of transfer function using block diagram reduction techniques and Mason's Gain formula. Error detectors, Signal conditioners, Modulators, Demodulators, Servo amplifiers voltage and power, Actuators including servomotors, Techogenerators, Stepper motor.

UNIT II

Time–Domain Analysis :Time domain analysis, transient response of first & second order systems ,steady state error and static error constants in unity feedback control systems, response with P, PI and PID controllers, limitations of time domain analysis.

UNIT III

Frequency Domain Analysis and Stability : Concept of stability, graphic and numeric techniques of stability analysis, Routh Hurwitz, Nyquist, Bode plot, Root locii and polar plots, frequency domain specifications and performance of LTI systems, Gain and phase margins, relative stability. Correlation with time domain performance closed loop frequency responses from open loop response. Limitations of frequency domain analysis.

UNIT IV

State Space & Compensation Techniques: State space characteristics of control systems. Concepts of state variable, Transfer Function controllability and observability. Concepts of compensation, series/parallel/ series-parallel/feedback compensation, Lag/Lead/Lag-Lead networks for compensation.

References :

1. Control System Engg. By Nagrath and Gopal.
2. Control System Engg. By K.Ogata.
3. Liner Control System by R.S. Chauhan, (Umesh Publications)
4. Feedback control system Analysis and Synthesis by D'Azzo and Houpias.
5. Control System by B.C. Kuo.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-309N	**Power Transmission & Distribution**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT- I

Transmission of Power by A.C. & D.C. system: Typical power system, Modern trends in power system transmission . Underground and overhead system, Effects of increase in Voltage on transmission line efficiency
Distribution of Power: General consideration, Radial and ring main system. Different types of distributors; Relative copper consumption in various systems. Conductor size and Kelvin's Law, Tariffs and power factor improvement.

UNIT- II

Resistance of transmission lines, skin effects, Proximity effect,
Inductance of a single phase & two phase line, Composite conductor lines, Three phase lines with symmetrical and unsymmetrical spacing, , Bundled conductors
Capacitance of two-wire line, three phase line with symmetrical and unsymmetrical spacing, Effect of earth capacitance.

UNIT- III

PERFORMANCE OF LINES Short, medium and long lines – their representation, Performance calculation, determination of ABCD parameters, Ferranti effect, Surge impedance Loading of transmission lines, , Calculation of synchronous phase modifier capacity.
Corona loss & radio interference Factors affecting corona , advantages and disadvantages of corona, disruptive critical voltage, visual critical voltage, corona power loss, methods of reducing corona effects, advantages & disadvantages of corona, interference of power lines with neighboring communication lines.

UNIT IV

Underground cables, Cables for A.C & D.C systems, Insulation resistance and capacitance, capacitance measurement, cable loss, Power factor in cable. Heating of cables Thermal characteristics, Use of inter sheaths, Capacitance grading.

Mechanical Considerations Types of Insulators, Methods of equalizing voltage distribution, Line supports, various types of conductor material, Sag calculations, Effect of wind, Ice and temperature on sag, Conditions at erection.
Text Books/References:

1. Power System analysis and Stability by S.S. Vadhera
2. Electrical Power System by C.L. Wadhwa
3. Electrical Power System by Ashfaq Hussain
4. Elements of Power System Analysis by W.D. Stevenson
5. Electric Power System by B.M. Weddy
6. The transmission and Distribution of Electric energy by H. Cotton
7. Modern Power System Analysis by I.J. Nagrath and D.P. Kothari
8. A Course in Electrical Power by Soni, Gupta and Bhatnagar

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-311N	**Field & Waves**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT – 1

Review of vector algebra, the three orthogonal co-ordinate systems and their inter-relation, review of vector calculus in all the three coordinate systems: Line, surface & volume integrals, gradient, divergence & curl of vector & their physical significance, Divergence theorem, stokes theorem, concept of soleniodal and irrotational fields.

Gauss Law in electrostatics & its applications, uniform line, surface & volume charge distributions, concept of electric field & electric potentials, electric field & potential due to a linear dipole, Spherical & cylindrical capacitor, energy density in electric field, method of images.

UNIT-II

Magnetostatics: Magnetic flux density and magnetizing field intensity, Biot Savart's law, Amperes circuital law & its applications. Magnetic vector potentials, Magnetic field energy, boundary conditions for both the electric & magnetic fields at the interface of various types of media. Laplace, Poisson's equation & continuity equation, displacement current density, conduction current density, Maxwell's equation in differential & integral forms, time harmonic cases & their physical significance, retarded potentials.

UNIT- III

UPW: Plane waves & uniform plane waves and their properties , wave equations in various media, Polarization & its types, intrinsic impedance, propagation constant, reflection & refraction of uniform plane waves at the interface of conductor- dielectric & dielectric-dielectric (both normal and oblique incidence). Relaxation time, skin effect, skin depth & surface impedance, Poynting vector theorem and its physical significance.

UNIT- IV

Transmission lines: Distributed parameters, circuit parameters, concepts of voltage & current flow on a transmission line, line equations, characteristics impedance. Reflection of transmission line, maxima & minima, standing wave ratio of a transmission line, impedance matching, Smith's chart & its applications, co-axial type transmission line.

Wave Guides: Brief idea of Wave Guides, types of Wave Guides. TE, TM and TEM modes in rectangular wave guides.

Reference Books:

1. Field & Waves Electromagnetic by D.K. Cheng. (Pearson Education)
2. Electromagnetic Fields & Wave by Sadiku (Oxford Univ. Press)
3. Electromagnetic by J.D. Kraus, MGH.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EE-313N	**Control System Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS:

1. Experiment to study linear system simulator.
2. To study the stroboscope & measure the shaft speed
2. Experiment to study light intensity control using P & PI controller with provision for and transient speed control.
3. Experiment to study D.C motor speed control.
4. Experiment to study the stepper motor characteristics and its control through microprocessor kit.
5. Experiment to study Temperature control system.
6. Experiment to study Compensation design.
7. Experiment to study Digital control system.
8. Experiment to study synchros.
10. Experiment to study AC Position control system.
11. Experiment to study Potential Metric Error detector.

NOTE: 10 experiments are to be performed with at least 8 from above list; the remaining may either be performed or designed & set by concerned Institution as per the scope.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EEN-315N	**VHDL Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS

1. Study of VHDL.
2. To design the two input NAND gate , NOR gate , EX-OR gate in VHDL .
3. To design a full adder & full subtractor using the same hardware & with the help of control signal.
4. To design a 4:1 multiplexer and 1:4 demultiplexer in VHDL.
5. To design a priority encoder in VHDL
6. To design a carry look ahead adder in VHDL.
7. To design a BCD adder & BCD subtractor in VHDL.
8. Write a program in VHDL to compute 2's complement of a four bit binary numbers.
9. Write a program in VHDL to implement the Boolean expression . F= (A+ B) (C+D) using CMOS circuitry .
10. Implement a F= (A+ B) using only PMOS circuitry.
    (i) Design a MOD-6 synchronous & asynchronous (ripple) counter in VHDL.
    (ii) Design a MOD-8 ring & Johnson counter in VHDL.
11. How to Install the VHDL on Computers for VLSI programs

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EEN-317N	**Power Electronics Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS

1. To plot the firing characteristics of given silicon control rectifier.
   (A) By varying the gate current I_g keeping forward voltage V_{ak} fixed.
   (B) By varying forward voltage V_{ak} keeping gate current fixed
2. To study the V-I characteristics of given UJT (2n2646)
   To plot graph between V_e and I_e to find negative resistance region from the graph.
3. To plot V-I characteristics of given Triac in I and III quadrant.
4. To plot the drain characteristics of given FET & to evaluate the parameter RD, IDSS.
5. To study the UJT based relaxation Oscillator and to evaluate the dynamic resistance.
6. To study and draw the characteristics of DC-DC Chopper power circuit.
7. To study the characteristics of Single Phase fully controlled converter circuit.
8. To study the characteristics of 3-Phase Fully controlled power circuit.
9. To study Single Phase Cycloconverter circuit.
10. To study 3-Phase half wave rectifier using MAT LAB.

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-302N	**Power System Engineering**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Introduction: Characteristics & representation of components of a power system, synchronous machines, transformers, lines cables & loads. Single line diagram.

Protective Relaying: Scheme of protection of generators, transformers, transmission lines & bus-bars, carrier current protection.

UNIT II

Circuit Interruption : Circuit interruption, theory of arc formation and it's excitation in d.c., a.c. circuits, restriking & recovery voltage, interruption of capacitive & inductive currents. Rupturing capacity & rating of circuit breakers.

Circuit-Breakers : Classification of circuit-breakers, circuit-breakers of low medium, high & extra high voltages. Multibreak & resistance switching. H.V. circuit breakers.

UNIT III

Fault Analysis:-

Symmetrical faults: Calculation of fault currents, use of current limiting reactors.

Unsymmetrical faults: Types of transformation in power system analysis, symmetrical components transformation.

Grounding: Need of neutral grounding, various types of neutral grounding technique, equipment earthing for safety.

UNIT IV

Transients in Power Systems: Transient electric phenomenon, travelling waves, reflection & refraction of waves with different line termination.

Stability of power System: Concepts of stability, power angle characteristics of Synchronous, steady state & transient stability swing waves.

References:

1. Elements of power system analysis by W.D. Stevenson.
2. Electric Power System by B.M. Weddy.
3. The transmission & Distribution of Electric Energy by H.Cotton.
4. Modern Power System Analysis by I.J. Nagrath & D.P. Kothari.
5. A course in Electrical Power by Soni, Gupta & Bhatnagar.
6. Power System Analysis & Stability by S.S. Vadhera
7. Electrical Power System by C.L. Wadhwa. 8. Electrical Power System by Ashfag Hussain.
9. Electrical Power by S.L. Uppal.
10. Switching & Protection by Sunil S. Rao.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-304N	**Data Communication & Networking**	**4**	**0**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I: Basic & Computer Networks, Need & Evolution of Computer Networks, Description of LAN, MAN, WAN and wireless Networks, OSI and TCP/IP models with description of Data Encapsulation & peer to peer communication, Comparison of OSI and TCP/IP, Basic terminology of computer networks- bandwidth, Physical and logical topologies, LAN & WAN devices- Router, bridge Ethernet switch HUB, Modem CSU/DSU etc.

UNIT II: Physical Layer- Representation, Optical Network and wireless N/W, Encoding/Modulation- TTL Encoding, Manchester Encoding, AM, FM and PM, Dispersion, Jitter, Latency and collision. Different types of Media- Shielded twisted pair, Unshielded twisted pair, Coaxial cable, Optical Fiber cable and wireless. Layer- LLC and MAC sub layer, MAC addressing Layer 2 devices, Framing Error control and flow control. Error detection and correction CRC Codes, block parity and Checksum, elementary data link protocol, sliding window protocol, Channel allocation problem- static and dynamic.

UNIT III: Multiple Alex protocol- ALOHA, CSMA/CU Token bus Tokening, FDDI.Network Layer, Segmentation and autonomous system path determination, Network Layer addressing, Network-layer data gram, IP addressed classes, Subneting,Sub network, Subnet mark, Routing algorithm- optimality Principle, Shortest path routing , Hierarchical routing, Broadcast routing, Multicast routing.

UNIT IV: Transport Layer- Layer 4 Protocol TCP & UDP Three way hand shakes open connection ATM AAL Layer protocol, Session Layer design issue, Presentation Layer design issue and Application layer design issue. Application layer Protocol, TELNET, FTP, HTTP, SNMP.

References:

1. Tannenbum, " Computer Networks," PHI
2. Darlx, " Computer Networks and Their Protocols", DLA Labs
3. Freer, " Comp. Communication & Networks" , East-West-Pre
4. Frozen, "Data Communication & Networking (TMH)
5. Stalling ,"Data & Computer Communication.(PHI)

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-306N	**Microprocessor & Micro Controller**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Introduction to microprocessor, **architecture** of 8085, description of 8085 pins, flags, registers, Demultiplexing the bus $AD_7 – AD_0$, instruction cycle, machine cycle,T-state, fetch cycle and execute cycle ; timing diagram; addressing mode; interrupts

UNIT II

Instruction set: Data transfer group instruction, arithmetic group, logical group, machine group,

branch group instructions, stack operation; sub routine.

Data Transfer Techniques: Memory mapped I/O & input/output mapped I/O space, program data transfer techniques, interrupt data transfer techniques, DMA.

UNIT III

Assembly language programming & interfacing : introduction of machine language; assembly language, high lavel language, example of assembly language programming; interfacing of the memory (RAM, ROM, EPROM, EEPROM) , input device and output device;

Special purpose support devices: : Brief description of 8255 PPI , 8253, 8251 USART

UNIT IV

Advanced 8086 microprocessor & microcontroller: 8086 microprocessor, its architecture, operating mode, pin description for minimum mode, pin description for maximum mode, comparison of 8086 & 8085.

Microcontroller: introduction of 8051 microcontroller & its block diagram, comparison of microprocessor and microcontroller

References:

1. R.S. GAONKAR: Microprocessor architecture, programming & Application.(MGH)
2. Malvino, A.P. : Digital computer electronics-an Introduction to microprocessor.(MGH)
3. D.V.HALL: Microprocessor & Digital circuits.(MGH)
4. MATHUR A.P. : Introduction to microprocessor

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-308N	**Electrical Machines Design**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

GENERAL: General features , limitations of electrical machine design, specific loadings **thermal design** types of enclosures, ventilation, heat dissipation, temperature rise, heating & cooling cycles, rating of machines, cooling media used, advantages of hydrogen cooling, effect of size and ventilation.

DC MACHINES: Main parts ,Output equation, choice of specific loadings, choice of poles and speed, Design of core length, armature diameter, depth of armature core ,air gap length, cross section of armature conductors, armature slots ,**design of field system** field poles, field coils, commutater.

UNIT II

TRANSFORMERS: Main parts of transformer, Standard specifications, output equation, voltage per turn , optimum design, design of core , design of winding, simplified steps for transformer design, tank and Cooling tubes, **Operating calculations** circuit parameters, magnetizing current, losses and efficiency, Temperature rise and regulations from design data.

SYNCHRONOUS MACHINES: Types of construction, types of synchronous alternators Specifications, output equation , **design of salient pole machines** main dimensions, short circuit ratio , length of air gap, choice of armature slots, turns per phase, conductor section , **design difference between turbo alternator & salient pole generators**, , direct & indirect cooling.

UNIT III

INDUCTION MOTORS:
Three Phase Induction Motor: Standard specifications, output equations, choice of specific loadings, main dimensions, conductor size and turns, no. of slots, slot design, stator core depth, **rotor design**, rotor bars& slots area, end rings .
SINGLE PHASE INDUCTION MOTOR: output equations, specific loadings, main dimensions, design of main and auxiliary winding, capacitor design, equivalent circuit parameters, torque, efficiency.

UNIT IV

COMPUTER AIDED DESIGN: Computerization of design procedures, development of computer programs & performance predictions, optimization techniques & their application to design problems.

TEXT BOOKS/REFERENCES:

1. Electrical Machine Design by A. K. Sawhney Dhanpat Rai & co.
2. M.G.Say, Performance and design of ac machines, CBS Publishers.
3. S.K. Sen., Principles of Electrical Machine Design with Computer Programs, Oxford and IBH.
4. A.E.Clayton, Hencock: Performance and design of dc machines, CBS Publishers.
5. J.H. Kuhlmann, Design of electrical operators, John Willey, 1957 .
6. CG Veinott, Theory and design of small induction machines, MGH, 1959
7. A Shanmugasundarem, Electrical machine design databook, John willey, 1979

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-310N	**Electric Drives & Traction**	**4**	**0**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Introduction: Definition & classification of different type of electric drives, its Review characteristics, choice of electric drive ,components of electric drives, advantages and applications.

Dynamics of Electric drives & Rating of motors: - Fundamental load torque equation, types of loads, frequency operation of motor subjected to intermittent loads, pulse loads etc. Determination of motor rating, Heating/cooling curve, Nature of loads and classes of motor duty.

Control of Electrical Drives: Modes of operation, closed loop control of drives, sensing of current and speed**.**

UNIT-II

D.C. drives: Various methods of braking of D.C. drives, Speed control methods of D.C. drives, 1-∅ fully controlled and half controlled rectifier fed separately excited D.C. motor, 3-∅ fully and half controlled fed separately excited D.C. Motor, Performance and characteristics of 1-∅ and 3-∅ rectifier controlled D.C. drives.

UNIT-III

AC Drives: Various methods of braking of A.C. drives, Speed control methods of A.C. drives, Basic principle of induction motor drives, 3 -∅ A.C. Voltage controller fed I.M drive, Drives using chopper, multi quadrant control of chopper fed motors, Synchronous motor Drives, Automatic starting and pulling operation of synchronous motors

UNIT-IV

Traction Drives: Nature of traction load, A.C. & D.C. motor drives in transportation system and traction & its characteristics, Duty cycle & speed time relationship, Polyphase A.C. motors for traction drives, D.C. traction using chopper controlled D.C. motors.

TEXT BOOKS:

1. Fundamentals of Electrical Drives, G.K.Dubey, Narosa Publishing House

REFERENCE BOOKS:

1. Power Semiconductor controlled drives, G.K.Dubey, Prentice Hall.
2. Electric Drives: V.Subrahmaniyam TMH
3. Electric Drives: Leonard, Narosa Pub.
4. Electric Drives: Diwan
5. Power Electonics : M.D.Singh, K.B.Knanchandani : Mc Graw Hill
6. Electric Motor Drives by Krishnan,PHI
7. Electric Drives: S.K.Pillai,New Age

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EEN-312N	**Digital Signal Processing**	**4**	**1**	**25**	**75**	**100**	**3 Hr**

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT I

Introduction: Basic elements of DSP system, Advantages and disadvantage of DSP over analog processing, Application of Digital signal processing.

Z-Transform: Direct Z-Transform and importance of ROC, properties of Z-Transform, Inverse Z-transform methods, Rational Z-transform function representation, system function of LTI systems in Z-domain, one sided Z –Transform. Solution of difference equations. Analysis of LTI system in Z- domain, transient and steady- state response. Causality and stability. Pole- Zero Cancellations.

UNIT II

FREQUENCY TRANSFORMATIONS

Introduction to DFT, Direct Computation of DFT ,Properties of DFT, Circular Convolution , Fast fourier Transform(FFT),decimation in time ,decimation in frequency algorithm, Use of FFT in Linear Filtering , Goetzel Algorithm, Chirp-Z Transform algorithm.

UNIT III

Structure of Discrete-Time Systems: Structure for FIR Systems-direct form, Linear Phase, Cascade form, Frequency-Sampling structures, Structures for IIR- Direct, Cascade, Parallel & transposed structure, signal flow graphs .

Design for Digital Filters:- Symmetric and anti-symmetric FIR filters; Design of Linear Phase FIR using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency Sampling Method of FIR design, Impulse Invariance transformation, Bilinear transformation and its use in design of Butterworth and Chebyshev IIR Filters; Frequency transformation in Digital Domain, Matched Z-Transformation.

UNIT IV

Implementation of Discrete Time Systems:
Lattice, Ladder and Lattice-Ladder Structures, Shur- Cohn Stability test. Jury Test, Shur-Cohn-fuzzivera stability criterion for IIR filters, Discrete Hilbert Transform.
DSP processor architecture fundamentals: Study of ADSP and TMS series of processor architectures.

References:

1. Digital Signal Processing by J.G. Proakis and D.G. Manalakis-PHI
2. Digital Signal Processing by: A.V. Oppenheim and R.W. Schafer-PHI
3. Element of Digital Signal Processing by N. Sarkar Khanna Publishers.
4. Digital Signal Processing by S. K. Mitra –TMH.
5. Digital Signal Processing by Rabinar, Gold-PHI
6. Digital Signal Processing by S. Salivahanan- TMH
7. Digital Signal Processing by lFecher

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EEN-314N	**Digital Signal Processing Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS / PROGRAMS:

1. Write a program in MATLAB to study the basic operation on the discrete time signals. (Amplitude and time manipulation).
2. Write a MATLAB program to perform discrete convolution (linear and circular) for a given two sequences.
3. Write a MATLAB program to perform the DFT for a given sequence.
4. Write a MATLAB program to compute DFT and IDFT for a given sequence using FFT algorithem.
5. Write a MATLAB program to perform sampling rate conversion for any given arbitrary sequence by interpolation, decimation, upsampling, downsampling and resampling.
6. Write a MATLAB program to find the time domain response (Impulse response and phase response) for a given FIR and IIR systems.
7. Write a MATLAB program to find the frequency domain response (magnitude response and phase response) for a given FIR and IIR systems.
8. Write a MATLAB program to design a low pass filler using window method for the given specification.
9. Write a MATLAB program to design Butterworth and Chebyshev low pass filler using bilinear transformation and Impulse Invariant Transformation.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EEN-316N	**Microprocessor Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS:

1 To study the 8085-microprocessor kit.

2 Add two Binary numbers using 8085-Microprocessor kit.

3 Find 2's complement of a binary number using 8085-Microprocessor kit.

4 To arrange a series of numbers in descending order using 8085- Microprocessor kit.

5 Multiplication of two binary numbers using 8085-Microprocessor kit.

6 Divide a 16-bit number by 8-bit number and restore result in memory location 2700 using 8085-Microprocessor kit.

7 To find Square root of a 8- bit number using 8085-Microprocessor kit .

8 To find the largest number in a data array using 8085-Microprocessor kit.

9 To interface a D/A converter with the 8085-microprocessor kit.

10 To interface the stepper motor with the 8085-microprocessor kit.

Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EEN-318N	**Power System Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS:

1. To find out the dielectric strength of transformer oil.
2. To find zero sequence component of three phase line.
3. To draw the characteristics of thermal overload relay.
4. To study an IDMT over current relay to obtain and plot its characteristic curves i.e. the graph between current and time.
5. To measure the ABCD parameters of a given transmission line.
6. To plot the power angle characteristics of given transmission lines.
7. To find the string efficiency of a string insulator with/without guard rings.
8. To study the characteristics of transmission line for t-network & pie- network.
9. To study and testing of a current transformer.
10. To study various types of distance relays.

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Code	Nomenclature of Lab	P	Int.	Ext.	Total	Time
EE-320N	**Electric Drives Lab**	**2**	**40**	**60**	**100**	**3 Hr**

LIST OF EXPERIMENTS-

1. Study of Industrial Applications of various mills.
2. Variable Torque Control of Induction Motor.
3. Breaking of DC Motor by using Mechanical & Electrical Methods.
4. Rotor resistance control of 3 phases Slip Ring Induction Motor.
5. Chopper Control of DC Motor.
6. Chopper Control of separately excited DC motor.
7. Study of different types of a loading on a particular load.
   (a) Intermediate Loading
   (b) Continuous Loading
8. Methods of starting Induction Motor.
9. Variable Voltage Control of Induction Motor.
10. Microprocessor Based Control of any Motor.
11. To study direct torque control of DC motor in MATLAB.

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution.

KURUKSHETRA UNIVERSITY KURUKSHETRA

SCHEME OF STUDIES/EXAMINATIONS

Bachelor of Technology (Textile Technology)
Semester – V (w.e.f. 2017-18)

SN	Course No.	Course Title	Teaching Schedule (hrs)				Allotment of Marks				Duration of Exam (hrs)
			L	T	P/D	H/wk	Theory	Sessional	Practical	Total	
1	TT-301N	Structure and Properties of Fibres	4	1		5	75	25		100	3
2	TT-303N	Yarn Manufacturing - III	4	1		5	75	25		100	3
3	TT-305N	Fabric Manufacturing - III	4	1		5	75	25		100	3
4	TT-307N	Fabric Structure & Design	4	1		5	75	25		100	3
5	TT-309N	Statistical Analyses	4	1		5	75	25		100	3
6	TT-311N	Yarn Manufacturing-III Lab			3	3		40	60	100	3
7	TT-313N	Fabric Manufacturing-III Lab			3	3		40	60	100	3
8	TT-315N	Fabric Structure &Design Lab			3	3		40	60	100	3
9	TT-317N	Industrial Training-I	1			1		100	---	100	
Total			**21**	**5**	**9**	**35**	**375**	**245**	**180**	**900**	

KURUKSHETRA UNIVERSITY KURUKSHETRA

SCHEME OF STUDIES/EXAMINATIONS

Bachelor of Technology (Textile Technology)
Semester – VI (w.e.f. 2017-18)

SN	Course No.	Course Title	Teaching Schedule (hrs)				Allotment of Marks				Duration of Exam (hrs)
			L	T	P/D	H/wk	Theory	Sessional	Practical	Total	
1	TT-302N	Theory of Textile Structure	3	1		4	75	25		100	3
2	TT-304N	Textile Testing-II	3	1		4	75	25		100	3
3	TT-306N	Garment Technology	3	1		4	75	25		100	3
4	TT-308N	Knitting Technology	3	1		4	75	25		100	3
5	TT-310N	Computer Aided Fabric Manufacturing	3	1		4	75	25		100	3
6	TT-312N	Multi Fibre Spinning	3	1		4	75	25		100	3
7	TT-314N	Garment Technology Lab			3	3		40	60	100	3
8	TT-316N	Knitting Technology Lab			2	2		40	60	100	3
9	TT-318N	Computer Aided Fabric Manufacturing Lab			3	3		40	60	100	3
10	TT-320N	Textile Testing-II Lab			3	3		40	60	100	3
Total			**18**	**6**	**11**	**35**	**450**	**310**	**240**	**1000**	

Note: The students will have to undergo another six weeks Industrial Training after VI sem and it will be evaluated during VII sem through submission of certified computerized report to the Head of the Department followed by viva-voce, seminar/presentation.

TT-301N
STRUCTURE AND PROPERTIES OF FIBRES

L	T	P
4	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 Hrs.

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

UNIT-I

Structure of fibres

Morphology and order in fibre structure, concept and theories of orientation, crystallization and its measurement technique such as X-ray.

Chemical and physical structure of fibres such as wool, silk, cotton and bast fibre and man-made fibre such as Nylon, PET, Acrylic and Viscose.

UNIT-II

Mechanical properties

Theory of load-elongation curve, stress-strain curve, modulus, elasticity and visco elasticity, work of rupture/toughness, yield point, creep and stress relaxation behavior of fibres and simple spring and dash pot models simulating textile fibers.

Frictional properties of fibers

Nature and measurements.

UNIT-III

Moisture properties

Relation between moisture regain and relative humidity, hysteresis, absorption in fibers, diffusion theories of moisture absorption-general view, diffusion of moisture, quantitatative analysis of moisture absorption, swelling.

Optical properties of fibers

Refractive index and polarization of light, birefringence and its measurement.

UNIT-IV

Thermal properties

Molecular motion and transition phenomenon, thermal expansion behaviour, first order and second order transition phenomenon.

Electrical properties

Introduction to electrical properties such as dielectric properties such as electric properties and static charge generation

Suggested Text Books and References

1. Morton W E and Hearle J W S, “Physical Properties of Textile Fibres”, The Textile Institute, Manchester(1993)
2. Meredith R, “The Mechanical Properties of Textile Fibres”, North Holland co; Amsterdam(1959)

TT-303N
YARN MANUFACTURING-III

L	T	P
4	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

UNIT-I

Forces acting on yarn and traveler during spinning, spinning tension in ring frame, Theory of yarn balloon, Limitations of ring spinning systems, modern developments in ring frame, Introduction to open-end spinning, Comparison of ring frame with other modern spinning technologies.

UNIT-II

Rotor Spinning: Principle of yarn formation, machine parameters, effect of machine variables and fibre properties on the rotor yarn property, raw material requirement and preparation, The opening unit.

Yarn formation: Fibre flow into the rotor, Formation of the yarn, the false twist effect, wrapping fibres. The Rotor groove, Rotor diameter, Combination of rotor dia, & rotor groove. Back doubling, Rotor revolutions, cleaning the rotor.

Yarn withdrawal and winding: The direction of withdrawal, the naval, Withdrawal tube, Requirement for the package, Economic aspects of rotor spinning, Structure and properties of different types of yarns, end uses of rotor yarns.

UNIT-III

Friction spinning : Operating principle, Technological interrelationship, Advantages & disadvantages Dref-2 process & DREF-3 process :Operating principle ,use of raw material, Study of electrostatic, air-vortex spinning, mechanism of yarn formation, properties and end uses of yarn spun on these systems.

The false-twist process: generation of false twist, Forming a yarn with the aid of false twist spinning elements.

Murata Jet spinner: operating principle, Raw material requirements, Yarn Characteristics and end uses.

UNIT-IV

Comparative analysis of yarn structure, properties and their end use application produced from rotor, air-jet, friction techniques viz a viz ring spun yarn.

Compact Spinning: principle, different methods of fibre compacting, properties of yarn.

Production of fancy yarn & uses.

Production of Industrial yarn- Sewing thread.

Suggested Text Books and References

1. Klein. W., " Manual of Textile Technology", 'Short Staple Spinning Series', Vol. 1 to 5. --- Textile Institute. Manchester.
2. Chattopadhyay, R., "Advances in Technology of Yarn Production, 1st Ed., NCUTE, IIT Delhi (2002).
3. Oxtoby, E., Spun Yarn technology.
4. Khare A. R., "Elements of Ringframe and Doubling", Sai Book Centre,Mumbai.

TT-305N
FABRIC MANUFACTURING-III

L	T	P
4	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

Unit I:
Introduction to Shuttleless Weaving. Advantages of Shuttleless weaving, comparison with shuttle weaving. Features of unconventional weaving. Different Selvedge: Tucked-in, Leno, fused, Stitched. Their mechanism of formation, their characteristics and uses. Weft Accumulator.
Projectile weaving Machine: Basic principle of projectile weaving. Feeding of yarn to projectile. Sequence of weft insertion. Cam driven shedding, Dwelling Sley beat-up, Torsion bar picking. Energy utilization during picking.

Unit II:
Rapier Weaving Machine: Classification based on type of rapier, system of weft insertion and number of rapiers. Sequence of weft insertion for Gabler and Dewas system, their comparison. Driving of flexible and rigid rapiers. Asynchronized rapier timing. Rapier buckling.
Air Jet Weaving Machine: Principle of weft insertion. Air requirements. Path of the yarn on loom. Sequence of weft insertion. Control of air stream by relay nozzle, confuser profile reed and suction. Design of air jet nozzle. Air drag force, factors affecting drag force.

Unit III
Water Jet Weaving Machine: Principle of weft insertion. Path of the yarn on loom. Quality of water required. Sequence of weft insertion. Water jet nozzle. Merits and demerits of water jet weaving. Fabric drying on loom.
Multiphase Weaving: Principle of multiphase weaving. Warp way and weft way multiphase looms. Circular loom.
Positive Let-off: Hunt's let-off, electronic let-off.
Positive Continuous Take-up: Sulzer take-up and Shirley take-up.

Unit IV
Nonwoven: Definition and classification. Fiber properties requirements. Parallel laid, cross laid, aerodynamic, wet laid and Spunbonded technique of web formation. Web bonding techniques: Needle punching, Spunlace, Spunbond, Meltblown Thermal bond and Chemical bonding. Application of various non woven fabrics.

Suggested Text Books and References

1. Talukdar, M.,"Weaving Mechanism, Management", Mahajan Publisher, Ahmedabad.
2. Adanur, S. "Weaving Technology".
3. Swaty,"Shuttleless Weaving".
4. Madhavamurthy,"Nonwoven".

TT-307N
FABRIC STRUCTURE & DESIGN

L	T	P
4	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

UNIT –I

Elements of Color:-Physical basis of color, light and color phenomenon, complementary colors and color measurements, attributes of primary and secondary color, color contrast and color harmony, application of color.

UNIT - II

Basic concepts of fabric structure, importance of fabric structure, classification of fabrics, notation of weave, weave repeat unit, drafting plan, construction of draft and lifting plans, peg plan and denting.

Simple Weaves

Plain weave and derivatives-basket, rib, repp

Twill weave and derivatives- zig-zag, herringbone, broken, steep, elongated; effect of twist on prominency of twill lines

Fabric set calculation

Yarn and cloth relationships-GSM Calculation

UNIT – III

Simple Weaves (contd.)

Sateen & Satins.

Crepe weaves, Mock-leno, Cork screw, Honey-comb, Huck-a-back, Bed ford cord, Welt and pique fabrics, Extra warp and weft figuring

UNIT -IV

Backed Cloth, Double cloth, multi-layers fabric, belting structures, label weaving-narrow fabric, velvet and velveteen.

Suggested Text Books and References

1. Watson's Textile Design and Colour : Elementary weaves and Figured fabrics, edited by Z. J. Grosicki., Woodhead Publication, Seventh edition.
2. Watson's Advance Textile Design: Compound Woven Structure edited by Z. J. Grosicki, Woodhead Publication, Series No.-2.
3. Fabric Structure and Design, by N.Gokarneshan, New Age International, 2nd Edition.

TT – 309N
STATISTICAL ANALYSES

L	T	P
4	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

UNIT -I

Foundations of statistics

Basic concepts of statistics, collection sampling, classification and graphical representation of data, Measures of central tendency. Numerical problems.

Sampling Theory

Population and sample, types of sampling, sampling classification and graphical representation of data, measures of central tendency, control charts.

UNIT -II

Measures of Dispersion Range, Quartile deviation, standard deviation, moments, skewness and kurtosis (Definition, properties and associated numerical only).

Theory of Probability

Different approaches to probability, Additive and Multiplicative Laws of probability, Baye's theorem.

UNIT-III

Tests of hypothesis and significance

Definition of Statistical hypothesis, Null hypothesis. Type I and II errors and Levels of significance, Standard error and sampling distribution,

Tests of significance for large and small Samples (discussion).Problems based on χ^2-test for goodness of fit, Student's t-Test and Analysis of variance (one way and two way classifications).

UNIT-IV

Regression & correlation

Karl Pearson's coefficient of correlation, Rank correlation coefficient and lines of regression, Numerical problems, factorial design and analysis.

Suggested Text Books and References

1. Ray and Sharma, "Mathematical Statistics"
2. Bowker, A.H., and Liberman, G.J., "Engineering Statistics", Prentice Hall, N.J.1972.
3. Murray P Spiegel, "Theory & Problems of Probability & Statistics".
4. Bhattacharya,G.K., & Johnson, R.A.," Statistical Concepts and Methods", John Wiley, N.Delhi, 2002.
5. Hogg, R.V, Elliot, A.T.,"Probability and Statistical Inference", Pearson Education, 6th Edition.

TT-311N
YARN MANUFACTURING-III LAB

L	T	P
-	-	3

Practical/viva: 60 marks
Sessional: 40 marks
Total: 100 marks
Duration of Exam: 3 Hrs

LIST OF EXPERIMENTS

1. Study of operating principle, material flow and various parts of rotor spinning.
2. Study of drafting, twisting and winding operation of rotor spinning.
3. Study of operating principle, material flow and various parts of air jet spinning.
4. Study of drafting, twisting and winding operation of air jet spinning.
5. Study of operating principle, material flow and various parts of friction (Dref II and Dref III) spinning.
6. Study of drafting, twisting and winding operation of friction (Dref II and Dref III) spinning.
7. Study of Compact spinning, methods of fibre compacting, modification and attachments.
8. Assessment and control of variability in ring, rotor and air-jet spun yarns.
9. Idea of time and motion study.

Note: 7 experiments from the above list are to be performed by each student. The above experiments should be conducted and shall be decided on factors like:

1. Facilities installed at the Institute
2. Accessibility to industry & nearby institute like IIT Delhi, NITRA Gaziabad, Textile Committee and NITRA Panipat /any other reputed establishments.
3. Trend of technological developments in National & International perspective.

TT-313N
FABRIC MANUFACTURING –III LAB

L	T	P
-	-	3

Practical / Viva: 60 Marks
Sessional: 40 Marks
Total: 100 Marks
Duration of exam: 3 Hrs.

LIST OF EXPERIMENTS

1. To study the different selvedge formation: Tuck-in, Leno, Fused and Knitted selvedge.
2. To study the working of positive let-off and electronic let-off and their advantages.
3. To study the working of Matched cam beat-up.
4. To study the working of Electronic Dobby and development of designs in electronic dobby.
5. To study the working of Flexible Rapier loom system and sequence of weft insertion.
6. To study the working of Rigid Rapier loom system and sequence of weft insertion.
7. Studies on Somet flexible rapier drive.
8. To study the working of torsion bar picking and sequence of weft insertion in projectile loom.
9. To study the working of Air jet nozzle and sequence of weft insertion in air jet weaving. Problems of Air jet loom.
10. To study the advantages and disadvantages of various shuttle less looms.

Note: 8 experiments from the above list are to be performed by each student. The above experiments should be conducted and shall be decided on factors like:

a) Facilities installed at the Institute.
b) Accessibility to industry & nearby institute like IIT Delhi, NITRA Gaziabad, Textile Committee and NITRA Panipat /any other reputed establishments.
c) Trend of technological developments in National & International perspective.

TT-315N
FABRIC STRUCTURE & DESIGN LAB

L	T	P
-	-	3

Practical / Viva: 60 Marks
Sessional: 40 Marks
Total: 100 Marks
Duration of exam: 3 Hrs.

LIST OF EXPERIMENTS

1. Basic principles of woven fabric analysis and estimation of data for cloth production.
2. Recognition of yarn and fabric and material used in their construction.

Weave analysis of:

3. Plain weave and its derivatives.
4. Twill weave and its derivatives.
5. Satins and sateens.
6. Mock-leno.
7. Honey comb and brighten Honey comb.
8. Huck-a-back.
9. Crepe weaves
10. Diamond weave

Note: Any 8 experiments from the above list are to be performed by each student.

TT-317N
INDUSTRIAL TRAINING-I

Sessional: 100 Marks
Total: 100 Marks

At the end of the 4th semester B.Tech. course, each student, individual or in group, would observe and collect the general and technical knowledge/information pertaining to machinery, raw materials used, process, yarns and fabrics produced by the textile mills, in which he/she is undertaking 6 weeks practical/industrial training with prior approval of the institute .

Each student will have to submit a computerized report duly approved/certified by the trainer/guide/industry to the Head of department & the same will be evaluated along through presentation.

TT-302N
THEORY OF TEXTILE STRUCTURE

L	T	P
3	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

UNIT-I

Yarn geometry: Coaxial helix model, idealized yarn geometry relationship of yarn number and twist factor. Twist contraction and retraction, ideal and real yarns.
Packing of fibre in yarn. Ideal packing, hexagonal close packing and other forms. Deviation from ideal forms- concentrating and disturbing features, specific volume of yarns, relation between twist, diameter and twist angle.

UNIT-II

Introduction to fibre migration, Ideal migration, Mechanisms of migration- tension variation, geometric mechanism, combined mechanism, Tracer fibre technique, Parameters of migration, Migration in blended yarns.

UNIT-III

Extension of continuous filament yarn for small and large strains, Prediction of breakage, mechanics of staple fibre yarns – traditional view, modified approach by Hearle & El-Sheikh. Mechanics of blended yarn, Hamburger model.

UNIT-IV

Elements of fabric geometry. Cloth setting theories, Fabric cover, fractional and total cover. Fabric cover and fabric weight relationship, Pierce's fabric geometry, flexible and elastic thread model, jammed structure, square fabric, crimp interchange, Relationship between h, p, c, Kemp's Race Track Model.

Suggested Text Books and References

1. Hearle, J. W. S., Grosberg, P., and Backer, S., "Structural mechanics of fibre, yarn and fabrics", Wiley Interscience Publication.
2. "Textile Yarn, Technology, Structure & Application" – Goswami B.C., Martindale, J.G., Scardino F.L., Wiley Interscience publication, 1977, U.S.A.
3. Zurek, W., "Structure of Yarn", Foreign Scientific Publications.
4. Cloth Geometry, F.T Pierce.
5. Woven Textile Structure: Theory & Application, B. K. Behera & P. K. Hari, Woodhead Textiles Series No. 115.

TT-304N
TEXTILE TESTING - II

L T P
3 1 -

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:

Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

UNIT-I

Fabric Testing

Importance of fabric testing, scope of fabric testing.

Methods of tests for fabric dimensions and other physical properties; thickness, weight, crimp, shrinkage, air permeability, moisture permeability, Water-vapour permeability.wettability, shower-proofness, water-proofness and flame-resistance.

Aesthetic properties of fabric: drape, stiffness, bending, shearing, compression, crease recovery

UNIT-II

Fabric Tensile Testing

Fabric Strength Testing: Tensile, tearing and bursting strength tests; principles and operation of equipment, Fabric bending, shearing and draping properties: terminology, quantities and units. Experimental method.

Factors affecting the results of tensile testing. Evaluation and interpretation of tensile test results.

UNIT-III

Comfort and Handle

Fabric comfort: introduction, importance and classification of comfort. Thermal comfort, Moisture Transport, sensorial comfort, Moisture absorption and water repellency.

Objective assessment of fabric handle; KES and FAST system.

UNIT-IV

Testing of Technical Textiles

Testing of filtration charaterstics, test for geotextiles, test for protective clothing, test of various form of medical textiles, moisture transmission through breathable fabrics, Special tests for carpets and nonwoven fabrics.

Mechanical behaviour of textiles. Terms and definitions, expressing the results, quantities and units.

Statistical Quality control in Textiles: tolerance limit, their setting, Control charts, Types of control charts – X-R chart, P chart, nP chart.

Suggested Text Books & References

1. Booth, J.E., “Principles of Textile Testing”, Butterworths, London
2. Kothari, V.K., “Physical Testing of Textiles”
3. Fabric testing, ED. Jinlian HU, Woodhead publication CRC Press, 2008.
4. Saville, BP, Physical testiong of textiles, Woodhead publication CRC Press 1999.
5. Slater, “Textile Progress – Physical Testing and Quality Control”, Textile Institute, Manchester.

TT-306N
GARMENT TECHNOLOGY

L	T	P
3	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

UNIT-I

Introduction to clothing manufacturing. The structure of clothing industry. Organization chart of clothing factory. Raw materials and accessories for garment industry. Relationship between fabric properties and making up process. Fabric quality requirement for garment industry.
Trimming and garment accessories: definition, types, trimming methodologies accessories application. Evaluation of sewability.

UNIT-II

Pattern Making: Introduction to pattern making and garment construction. Different terminologies, Drafting, Basic bodies, blocks. CAD for pattern making.
Spreading and Lay Planning: introduction to symmetrical and asymmetrical fabrics. Criteria for spreading, methods of spreading, spreading machines. Principles of lay plan, types of lay plan.

UNIT-III

Planning, drawing and reproduction of marker. Methods of marker planning and marker used – normal marker planning and computerized marker planning. Cutting by straight knife, band knife, notches, drills. Computer controlled knives, die cutting, laser cutting, plasma cutting.

UNIT-IV

Sewing: Properties of seams, seam types, stitch types, sewing machine feed mechanism, sewing machine needles, sewing threads, sewing problems.
Introduction to Sewing Machinery: Basic sewing machines and associated work aids.
Pressing: Purpose of pressing, pressing equipment and methods.
General description to alternative methods of joining materials. The use of components, trimmings to care labeling in Garment manufacturing.

Suggested Text Books and References

1. Coocklin Gerry, “Garment Technology for Fashion Designer”, Om Book Service, New Delhi.
2. Emilio Pucu, “Fashion from Concept to Consumer”.
3. Harold Carr & Barbar Lantham, “The Technology of Clothing Manufacture”, Om Book Service, New Delhi.
4. Aldrich W, “Metric Pattern Cutting”, Om Book Service, New Delhi.
5. Mehta P V and Bhardwaj S K, “managing Quality in Apparel Industry” Om Book Service, New Delhi

TT-308N
KNITTING TECHNOLOGY

L	T	P
3	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

UNIT-I

Introduction to Knitting: Difference between woven and knitted products and process. Classification of Knitting Machines. Terms and Definitions used in knitting. Elements of knitting: needles, sinker and cam.

UNIT -II

Basic weft knitted structures. Structure and properties of Plain, Rib, Purl & Interlock. Knit. Machine and mechanism of plain, rib, purl and interlock fabric production. Tuck & Float loops. Derivatives of some Knitted structure.

UNIT -III

Production calculation. Calculation of Areal density, Fabric width, Fractional cover, Tightness factor and mass per running meter. Knitted fabric relaxation and shrinkage, Values of Kc, Kw & Ks. Yarn property required for knitting. Control of yarn tension during knitting. Knitted fabric defects.

UNIT -IV

Warp Knitting

Comparison between warp knits, weft knits and woven. Basic warp knit structures: over lap, under lap, closed lap, open lap. Knitting cycle in Tricot Knitting machine and Raschel knitting machine, Five Basic overlap, under lap variations, some warp knitted structures like, loop raised, satin, lock knit, two bar tricot, reverse lock nit, shark skin, queens cord, Open Atlas, Closed Atlas, etc.

Suggested Text Books and References

1. Spencer D. J., “Knitting Technology” Woodhead Publishing Ltd. Cambridge, England.
2. Ajgaonkar, D. B. “Knitting Technology”.
3. “Knitting Technology” NCUTE Publication.
4. Booth J. E., “Textile Mathematics Vol-3” The Textile Institute Manchester Publication.

TT-310N
COMPUTER AIDED FABRIC MANUFACTURING

L	T	P
3	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

Unit-I

Basic Concepts

Overview of CAD and CAM, their application in various fields of textiles and benefits.
Concepts of image processing.

Design Fundamentals

Development of printable designs for screen printing through CAD- ArahPaint; tools of ArahPaint software module; scanning of pictures and editing.
Calculation of Fabric parameters through CAD.

Unit-II

Electronic Dobby

Working principle, machine parameters.
Design features, drive arrangement, system for pattern data transfer and design development.

Electronic Jacquard

Working principle, constructional variants, various electronic jacquard systems.
Selection system, pattern data transfer and management.

Unit-III

CAD for Dobby, Jacquard

Development of Dobby Designs through ArahWeave,
Development of jacquard designs-modes of weaving in ArahWeave software, other features of ArahWeave – Weave Simulation, Fabric Simulation, Yarn and Fabric Parameters.

Unit-IV

Development of figures, geometric ornamentations, arrangement of figures.
Narrow fabric production through CAD, Carpet designing through CAD.
Embroidery Designing through CAD, 3-D draping-Application and tools.

Suggested Text Books and References

1. Phiroz Dastoor, "Application of CAD in the Industrial Fabrics", Journal of the Textile Institute Part - 111, Manchester, 1993.
2. Aldrich, W. (Ed.), " CAD in clothing and textiles: A collection of experts view ", Blackwell, Science, 2nd Edition, U.K., 1994.
3. Jayaraman, S, "Computer Science and Textile Science ", T.P. Vol.26 No.3, Textile Inst.,Manchester, 1995.
4. Sigmon D.M. Grady, P.L. and Winchester S.C. " Computer integrated manufacturing and total quality management ", Textile Progress Vol 27, No 4, Textile Institute, Manchester, 1998. ISBN: 1870372166.
5. Gray S., "CAD/CAM in clothing and textiles ", Gower, U.K, 1998, ISBN: 056607673X.
6. Lab Manuals of ArahPaint, ArahWeave and ArahDrape.

TT-312N
MULTI FIBRE SPINNING

L	T	P
3	1	-

Sessional: 25 Marks
Exam: 75 Marks
Total: 100 Marks
Time: 3 hrs

Note:
Nine questions each of 15 marks will be set in the question paper i.e. two from each unit. The student will be required to attempt one question from each unit. Question No.1 is compulsory. It is objective type 15 questions of multiple choice covering all the four units.

Unit I
Characteristics of man-made fibres, objectives of blending, selection of fibre specification for blending, processing of short, medium and long staple man made fibres on cotton system, measures of blend intimacy, factors influencing blend intimacy, structure an properties of blend yarns, Effect of blend composition & fibre characteristics on properties of blended yarn. Blend mechanics. Advantages & disadvantages of different blending technique. Tinting for a blend spinning of dyed fibres.

Unit II
Woolen, semi-worsted and worsted systems of spinning. Wool blending, wool sorting, wool contamination and its removal, wool scouring, drying, back washing. Woollen carding, intermediate gilling, auto leveler in gillbox, rectiliniear combing, rubbing frame, and spinning.

Unit III
Jute Spinning: Basic concepts of the spinning process and the machinery. Jute retting, stripping, jute grading, jute batching, fibre defects. Jute carding; breaker and finisher card. Drawing and Spinning.

Unit IV
Silk Spinning: Introduction to twisting and spinning of silk fibres, Spun silk processing – Spreader, Sett Frame, Drawbox, Rover.
Waste Spinning: Cotton waste and its varieties, classification and possible end uses, machines and processes to produce waste yarns e.g. condenser system, coiled system.

Suggested Text Books and References

1. Salhotra K R, “Spinning of man-mades and blends on cotton system”.
2. Oxloby, E. “Spun Yarn Technology”. Butterworths, London.
3. Goswami, B.G. “Textile Yarns; Technology , Structure & Applications”. Textile Institute, Manchaster.
4. Wool Hand Book Vol II , Werner von Bergei.
5. Jute- Fibre to yarn by R R Atkinson.
6. British Wool Manual by H Spibei.
7. Wool Spinning vol I & II by Lipenkov.
8. Manual of Silk Reeling – F.A.O.
9. Fundamentals of Spun Yarn Technology, Lawrence, 1st Ed., CRC Press, LLC, Florida, USA, 2003.
10. Manual of Technology: Woolen Yarn Manufacture – Richards R.T., Dand Sykes A.B. The Textile Institute,Manchester,1994.

TT-314N
GARMENT TECHNOLOGY LAB

L	T	P
-	-	3

Practical/viva: 60 marks
Sessional: 40 marks
Total: 100 marks
Duration of Exam: 3 hours

S. No.	Title of Experiment	No. of Turns
1.	Developments of patterns based on anthropometric data.	4
2.	Working on Sewing Machines.	2
3.	Production of different types of stitches (Chain stitch, Lock stich & Overlock stitch).	3
4.	Determination of seam strength.	2
5.	Determination of seam pucker.	1

TT-316N
KNITTING TECHNOLOGY LAB

L	T	P
-	-	2

Practical/viva: 60 marks
Sessional: 40 marks
Total: 100 marks
Duration of Exam: 3 hours

List of Experiments

1. Working on Flat Knitting Machine.
2. Development of Plain, Rib, and Interlock fabric samples.
3. Setting of knitting Cam.
4. Development of derivative knitted structures on flat bed knitting machine.
5. Analysis of knitted structures.
6. Determination of K_s, K_c and K_w values.
7. Effect of stitch length, stitch density, course count, wale count on fabric arial density.

TT-318N
COMPUTER AIDED FABRIC MANUFACTURING LAB

L	T	P
-	-	3

Practical/viva: 60 marks
Sessional: 40 marks
Total: 100 marks
Duration of Exam: 3 hours

S. No.	Title of Experiment	No. of Turns
1.	Working with Paint Module of the software	3
2.	Scanning and editing a fabric artwork.	2
3.	Development of Dobby design on system.	1
4.	Development of Jacquard design on system.	2
5.	3D draping and its tools.	1
6.	Weave simulation on CAD.	2
7.	Development of label design through CAD.	1
8.	Production of sample in print format	2

TT-320N
TEXTILE TESTING-II LAB

L	T	P
-	-	3

Practical/viva: 60 marks
Sessional: 40 marks
Total: 100 marks
Duration of Exam: 3 Hrs

List of Experiments

1. To determine the stiffness property of the fabric.
2. To determine the tensile strength of the fabric.
3. To determine the tearing strength of the fabric.
4. To determine the bursting strength of the fabric.
5. To determine air permeability of fabrics.
6. To determine the shower proof property of a fabric.
7. To determine the drape property of fabrics.
8. To determine the crimp and Areal density of fabrics.
9. To determine crease resistance property of the fabric.
10. To determine the pilling property of the fabric.
11. To determine water vapor permeability of the fabric.
12. To determine the thermal comfort property of the fabric.

Note: 8 experiments from the above list are to be performed by each student. The above experiment should be conducted and shall be decided on factors like:

a) Facilities installed at the Institute.
b) Accessibility to industry & nearby institute like IIT Delhi, NITRA Ghaziabad, Textile Committee and NITRA Panipat/any other reputed establishment.
c) Trend of technological developments in National & International perspective.

KURUKSHETRA UNIVERSITY KURUKSHETRA

SCHEME OF STUDIES/ EXAMINATIONS

BACHELOR OF TECHNOLOGY (CHEMICAL ENGINEERING)

Semester-V (w.e.f. 2017-18)

SN	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Dur. of Exam (Hrs.)
			L	T	P	Hr/ Wk	Theory	Sessional	Practical	Total	
1	CHE-301 N	Mass Transfer-I	4	1	0	5	75	25	0	100	3
2	CHE-303 N	Chemical Reaction Engineering-I	4	1	0	5	75	25	0	100	3
3	CHE-305 N	Polymer Science Engineering	4	0	0	4	75	25	0	100	3
4	CHE-307 N	Chemical Engineering Thermodynamics-II	4	1	0	5	75	25	0	100	3
5	CHE-309 N	Chemical Technology-II	4	1	0	5	75	25	0	100	3
6	CHE-311 N	Chemical Reaction Engineering-I (P)	0	0	2	2	0	40	60	100	3
7	CHE-313 N	Chemical Engineering Thermodynamics-II (P)	0	0	2	2	0	40	60	100	3
8	CHE-315 N	Mass Transfer-I(P)	0	0	3	3	0	40	60	100	3
9	CHE-317 N	Chemical Technology-II (P)	0	0	3	3	0	40	60	100	3
10	CHE-319 N	Industrial Training-I	0	0	1	1	0	100	0	100	
		Total	**20**	**4**	**11**	**35**	**375**	**385**	**240**	**1000**	

Note: Industrial Training which was undergone by the students after IV sem is to be evaluated during V sem as **(CHE-319N)** through submission of certified computerized report to the Head of the Department followed by viva-voce, seminar/presentation.

Semester-VI (w.e.f. 2017-18)

SN	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Dur. of Exam (Hrs.)
			L	T	P	Hr/ Wk	Theory	Sessional	Practical	Total	
1	CHE-302 N	Mass Transfer-II	4	1	0	5	75	25	0	100	3
2	CHE-304 N	Chemical Reaction Engineering-II	4	1	0	5	75	25	0	100	3
3	CHE-306 N	Process Dynamics and Control	4	1	0	5	75	25	0	100	3
4	CHE-308 N	Numerical Methods in Chemical Engineering	4	1	0	5	75	25	0	100	3
5	CHE-310 N	Process Modeling	4	1	0	5	75	25	0	100	3
6	CHE-312 N	Mass Transfer -II(P)	0	0	3	3	0	40	60	100	3
7	CHE-314 N	Chemical Reaction Engineering-II (P)	0	0	3	3	0	40	60	100	3
8	CHE-316 N	Process Dynamics and Control (P)	0	0	2	2	0	40	60	100	3
9	CHE-318 N	Process Modeling (P)	0	0	2	2	0	40	60	100	3
		Total	**20**	**5**	**10**	**35**	**375**	**285**	**240**	**900**	

Note: The students will have to undergo another six weeks Industrial Training after VI sem and it will be evaluated during VII sem through submission of certified computerized report to the Head of the Department followed by viva-voce, seminar/presentation.

Objectives regarding Syllabus and Scheme for Bachelor degree of Chemical Engineering:

Chemical Engineering Bachelors courses such as Transfer Operations, Thermodynamics, Reaction Engineering, Process Control and Process Design help to develop a modularized understanding of these independent fields, with the expectation that the whole process is the sum of these individual parts.

Programme Objectives: The Chemical Engineering graduates will be able to:

1. Exhibit knowledge of basic sciences, concepts and principles of Chemical Engineering.
2. Comprehend, analyze, design and implement engineering systems with a focus on research, innovation and sustainability.
3. Work in multidisciplinary team & cater to the needs of process industry with appropriate safety, health & environmental regulations.
4. Demonstrate effective communication skills, leadership qualities and develop into successful Entrepreneurs.

CHE-301 N	Mass Transfer-I					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To familiarize the students with the concepts of Diffusion in fluids, Theories of mass transfer, coefficients, Humidification and Dehumidification, Drying Crystallization					
Course Outcomes						
CO1	To familiarize with types of diffusion and theories of mass transfer coefficient, , concept of equilibrium curve, operating line					
CO2	To familiarize with humidifiers and dehumidifiers. Design of cooling towers					
CO3	To familiarize with drying mechanism and types of driers					
CO4	To familiarize with Crystallization mechanism and types of crystallizers					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Diffusion in fluids: Molecular and eddy diffusion, Diffusivity; Diffusion through liquids and gases. Interphasemass Transfer: Theories of mass transfer, coefficients, concept of overall mass transfer coefficient, correlation for mass transfer coefficient ideal stage concept of single and multiple stage operation in co and counter current modes, concept of equilibrium curve, operating line.

UNIT – II

Humidification and Dehumidification: Adiabatic saturation temperature, wet bulb temperature, saturation temperature. Psychometric chart, dehumidification, humidifiers and dehumidifiers. Simultaneous heat and mass transfer. Design of cooling towers, determination of NTU, HTU.

UNIT – III

Drying: Principle of drying, mechanism and rate of drying, types of driers, calculations for batch and continuous dryers. Vacuum dryers.

UNIT – IV

Crystallization: Crystallization mechanism, growth of crystals, classification of crystallizers, material and energy balance, enthalpy concentration diagram super saturation. Batch crystallizers, continuous. Crystallizer, fractional crystallization.

TEXT BOOKS:

1. Mass Transfer Operations: R.E. Treybal- McGraw-Hill Book Company, New Delhi.
2. Sherwood. T.K. Pigford. R.L. and' Wilke, C.P. Mass Transfer, McGraw Hill (1e75).
3. Transport processes and separation process princilples. by C J Geankoplis,PHI,4th ed.

REFERENCE BOOKS:

1. Unit operations of Chemical Engineering : W.L. Mccabe & J.C. smith -McGraw Hill, New Delhi.
2. Chemical Engineering: J.M. Coulson and J.F. Richardson vol-l pergamon, New York.

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CHE-303 N	Chemical Reaction Engineering-I					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To familiarize with the Kinetics of Homogenous reactions, Design of single ideal reactors, Design of multiple reactions, Temperature and pressure effects on rate of reaction					
Course Outcomes						
CO1	To understand the Kinetics of Homogenous reactions					
CO2	To understand Design of single ideal reactors					
CO3	To understand Design of multiple reactions					
CO4	To understand the Temperature and pressure effects on rate of reaction					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Kinetics of Homogenous reactions: Concept of reaction rate, rate equation, order and molecularity, Collision and activated complex theories. Interpretation of batch reactor data: constant volume and variable volume batch reactors, integral and differential methods of analysis, continuous reactors, effects of concentration and temperature (Arrhenius equation).

UNIT- II

Design of Single Ideal Reactors: Design equation for single ideal reactor for single reactions for batch reactor, plug flow reactor and CSTR, Thermal stability of reactors, optimum temperature progression for first order reversible reactions.

UNIT- III

Multi reactions: Parallel and series reactions, mixed reactions, autocatalytic reactions, choice of reactors for simple and complex reactions, multiple reaction system.

UNIT- IV

Temperature and Pressure Effects: Calculations of heats of reaction and equilibrium constants. General graphical design procedure, Optimum temperature progression, and Energy balance equations in adiabatic and non-adiabatic case, Performance of mixed, plug flow reactors

TEXT BOOKS:

1. Chemical Reaction Engineering: Octave Levenspiel - W Eastern Limited, New Delhi.
2. Elements of Chemical Reaction Engineering: H. Scott Fogler - Prentice-Hall of India Pvt. Ltd. New Delhi.

REFERENCE BOOKS:

1. Kinetics and Mechanisms of Chemical Transformation J. Rajaram and J.C.Kuriacose-Macmillan India Ltd. New Delhi.
2. Chemical Engineering Kinetics: J.M. Smith- McGraw -Hill Book.

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CHE-305 N	Polymer Science Engineering					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**0**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To familiarize with the different types of polymer, molecular weight distribution, polymer processing and rhelogy					
Course Outcomes						
CO1	To understand different types of polymer, polymerization techniques and their kinetics.					
CO2	To understand molecular weight distribution and polymerization processes					
CO3	To understand polymerization processing techniques					
CO4	To understand rhelogy of fluids and models					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Definition, types of polymers, functionality, polymerization reactions, polycondensation. Addition-free radical and chain polymerization. Co-polymerization ,kinetics of radical chain and tonic polymerization. Gelation phenomena.

UNIT-II

Molecular Weight Estimation: Average molecular weight, number average and weight average molecular weight. polydispersity, degree of polymerization. Methods of determination of molecular weight.

Polymerization Processes: Bulk, solution, suspension and emulsion polymerization. Thermoplastic composites, fiber reinforcement fillers.

UNIT-III

Polymer processing: Thermoforming, injection molding, extrusion molding, calendaring rotational casting, film casting, blow molding, foaming' Fiber spinning wet dry and melt.

UNIT-IV

Rhelogy : Simple rheological response, simple linear viscoelastic : Maxwell and Voigt model ,material response time, temperature dependence of viscosity. Elasticity of polymers.

TEXT BOOKS :

1. Polymer science by Gowarikar, Wiley eastern

2, Polymer science of plastics and rubberc by P gosh, McGrraw Hill.

3. Textbook of polymer science by Billmayer, John Wiley.

CHE-307 N	Chemical Engineering Thermodynamics-II					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To understand the concept of residual properties, vapor liquid equilibrium, chemical equilibrium					
Course Outcomes						
CO1	To familiarize with laws of thermodynamics, Thermodynamic properties of pure fluids, residual properties					
CO2	To understand the Thermodynamic properties of homogeneous mixtures, Partial molar properties, excess Properties					
CO3	To understand the vapour-liquid equilibria (vLE), miscible azeotropes, Analysis of multi-component multiphase system					
CO4	To understand Chemical Equilibria, , effect of temperature and pressure on equilibrium constant, Duhem's theorem for reacting system.					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Review of laws of thermodynamics, their application to real processes, PVT behavior of pure fluids, virial equations, and generalized correlations, Relationships among thermodynamic properties , Thermodynamic properties of pure fluids: concept of residual properties, Thermodynamics properties of single and two-phase systems, generalized correlations for thermodynamic properties of gases.

UNIT-II

Thermodynamic properties of homogeneous mixtures: Property relationship for systems of variable composition: Partial molar properties: fugacity and fugacity coefficients, fugacity in ideal solutions property changes of mixing - activity, heat effects in mixing processes, excess Properties activity coefficients, gaseous mixtures

UNIT-III

Phase Equilibria: importance of phase equilibria in process industries, vapour-liquid equilibria (vLE), miscible azeotropes, VLE calculations at low and high pressures' Analysis of multicomponent multiphase system. Activity coefficients from experimental data in all Margules, Van-Laar, Wilson equations

UNIT-IV

Chemical Equilibria: Reaction coordinates application of equilibrium criteria to chemical Reactions standard Gibbs free energy change and the equilibrium constant effect of temperature on equilibrium constant, effect of temperature on equilibrium constantevaluation of equilibrium constants and composition, calculation of equilibrium compositions for single reactions, phase rule and Duhem's theorem for reacting system.

TEXTBOOKS:

1. Introduction to Chemical Engineering Thermodynamics : J.M. Smith and H.C.Van Nes s McGraw Hill Book Company, New Delhi
2. Chemical Engineering Thermodynamics: Y.V. .C.Rao, Universities Press (lndia) Ltd., Hyderabad, lndia'

REFERENCE BOOKS:

1. Chemical Engineering Thermodynamics T.E. Daubert - McGraw Hill, New Delhi.
2. Chemical Process Principles Vol- II, O.A. Hougen, K.M. Wastonand R. A.Regatz- Wiley

CHE-309 N	Chemical Technology-II					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To understand concept of oils and fat , sugar industry, petroleum refining, polymer technology, pulp and paper					
Course Outcomes						
CO1	To understand the concept of oils and fats , soaps and detergent					
CO2	To understand sugar industry and khandsari technology					
CO3	To understand the refinery operation for petrol, polymer types and modes of polymerization					
CO4	To understand the pulp and paper processes, paints and varnishes					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Oils and fats: Major oil seeds, solvent process, hydrogenation of oils.
Soaps and Detergents: Raw material, manufacturing of detergents, biodegradability, and glycerin manufacture, fat splitting, purification of fatty acids.

UNIT-II

Sugar Industry: Cane production and varieties, manufacturing equipment and technology, cane sugar refining, Bagasse utilization, Khandsari technology, Production of Ethanol.

UNIT-III

Petroleum Refining: General composition of crude oil, typical refinery operations for obtaining useful products, their utilization for manufacture of ethylene glycol, acrylonitile, styrene, and butadiene. Polymer: classification of polymers, degree of polymerization, modes of polymerization synthetic fibers (Nylon, terylene) synthetic & natural rubbers.

UNIT –IV

Pulp and Paper: pulping processes, recovery of chemicals, stock preparation and paper making, recovery, of chemicals, viscose rayon. Surface-coating Industries: paints, pigments, varnishes, Lacquers.

TEXTBOOKS:
l. Outlines of chemical Technology: C.E. Dryden-East-West Press Pvt. Ltd., New Delhi.
2. Shreve's chemical process Industries: G. T. Austin McGraw -Hill Book Company, New Delhi.

CHE-311 N	Chemical Reaction Engineering-I (P)					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
-	**-**	**2**	**60**	**40**	**100**	**3 (Hrs.)**
Purpose	To provide practical knowledge for the kinetic analysis of reaction by integral method of analysis and half life period and activation energy of reaction.					
Course Outcomes						
CO1	Students will be able to study kinetic analysis of reaction by integral method of analysis					
CO2	Students will be able to study kinetic analysis of reaction by half life period					
CO3	Students will be able to study the Saponification reaction.					
CO4	Students will be able to determine activation energy of reaction.					

List of Experiments:

1. To Determine the Reaction Kinetics between Ethyl Acetate and Sodium Hydroxide at Room Temperature by Integral Method of Analysis.
2. To Determine Activation Energy of the Reaction between Sodium-Thio-sulphate and Hydrochloric acid.
3. To Determine the Kinetics of the Reaction between the Ethyl Acetate and Sodium Hydroxide (NaOH) under Conditions of Excess Ethyl Acetate at Room Temperature
4. To Determine the Activation Energy and Frequency Factor for Reaction between Ethyl Acetate and Sodium Hydroxide (NaOH
5. To Determine the Rate of Reaction between Ethyl Acetate and Sodium Hydroxide (NaOH) at Room Temperature by the Method of Half Life Period.
6. To Study Cascade CSTR.
7. To Study Saponification Reaction in PFR.

CHE-313 N	Chemical Engineering Thermodynamics (P)					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
-	**-**	**2**	**60**	**40**	**100**	**3 (Hrs.)**
Purpose	To provide practical knowledge for the boiling point elevation and depression in freezing point and equilibrium curve for solution					
Course Outcomes						
CO1	Students will be able to determine heat of solution					
CO2	Students will be able to determine elevation in boiling point and depression in freezing point					
CO3	Students will be able to determine specific heat of conducting substance					
CO4	Students will be able to determine equilibrium curve of mixture					

List of Experiments:

1. To determine heat of solution
2. To study the elevation in boiling point of solution
3. To determine the heat of reaction between acid and base.
4. To determine depression in freezing point
5. To determine specific heat of conducting substance
6. To study the equilibrium curve for carbon tetrachloride and toluene mixture.

CHE-315 N	Mass Transfer-I (P)					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
-	**-**	**3**	**60**	**40**	**100**	**3 (Hrs.)**
Purpose	To make student able to understand concept of mass transfer coefficient and NTU in cooling tower, moisture content of material					
Course Outcomes						
CO1	Students will be able to determine mass transfer coefficient of liquid.					
CO2	Students will be able to determine Number of Transfer Unit (NTU in cooling tower.					
CO3	Students will be able to determine moisture content of material.					
CO4	Students will be able to determine the gas film coefficient of fluid mixture					

List of experiments

1. Determination of Gas Film Coefficient in a Wetted Wall Column Using Air-Water System
2. To Find Out The Critical Moisture Content of a Given Material And to Find out the Constant Rate and Falling Rate Periods
3. Determine the Diffusion Coefficient of Vaporizing of a Liquid in Air at Different Temperatures
4. (a)To Study Absorption of CO_2 in Aqueous NaOH Solution in a Sieve Plate Column.
   (b) To Determine the Gas Phase Mass Transfer Coefficient K_{ga} .
5. To Determine Number of Transfer Unit (NTU), Height of Transfer Unit (HTU) and K_{ya} for a Given Cooling Tower.
6. Study of Psychometric Properties.

CHE-317 N	Chemical Technology –II (P)					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
-	**-**	**3**	**60**	**40**	**100**	**3 (Hrs.)**
Purpose	To provide practical knowledge for the preparation of caustic soda, extraction of oil form groundnut seed ,Saponification value and preparation of detergent					
Course Outcomes						
CO1	Students will be able to determine acid value and Saponification value of oil					
CO2	Students will be able to extract oil from groundnut seeds					
CO3	Students will be able to prepare caustic soda and detergent					
CO4	Students will be able to do analysis of water by chemical methods					

List of experiments

1. To Prepare caustic soda by chemical method
2. To determine acid value of given sample of oil
3. To Prepare hydrated lime from given calcium carbonate powder
4. To extract the oil from groundnut seed and determine its extraction coefficient
5. To determine Saponification value of given sample of oil
6. To carry out analysis of water by chemical methods
7. To prepare detergent in the lab and to carry out its cost analysis.

CHE-302 N	Mass Transfer-II					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To understand the basic concept and application of Vapor Liquid equilibrium, McCabe Thiele Method , Absorption, Absorption and Extraction					
Course Outcomes						
CO1	To understand the concept of vapor liquid equilibrium, methods of distillation, McCabe Thiele method for number of plates					
CO2	To understand the concept of absorption, number of transfer units for the design of packed absorbers.					
CO3	To understand the concept of extraction, extraction efficiency, extractors.					
CO4	To understand adsorption and its characteristics, equilibrium stage wise adsorption					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Distillation: Vapour Liquid Equilibrium (VLC) data for binary mixtures, principles of distillation. Distillation methods: Flash distillation, Steam distillation. Differential distillation of binary systems. McCabe Thiele method for number of plates. Reflux ratio. Multiple feed. Intermediate product with drawn ,Plate efficiency. Packed distillation columns azeotropic and extractive distillation. Introduction to multi component distillation.

UNIT-II

Absorption: Equilibria for absorption system, use of Raoult's law, Henry's Law for solubility predictions, selection of absorbent. Limiting liquid/gas ratios. Absorption factors use in design of plate absorbers. Kremsers equations. Concept of transfer units for the design of packed absorbers.

UNIT-III

Liquid Extraction: Single and multistage extraction. Determination of number of equilibrium stage by graphical methods. Liquid- Liquid extraction: Equilibrium relationship for partially miscible and immiscible system. Selectivity and choice of solvent.
Determination of number of stages by graphical methods. Exraction efficiency. Constructional details of mixer settler. Pulsed reactor, sieve tray extractor, Bollman extractor.

UNIT-1V

Adsorption: Adsorption, types of Adsorption characteristics of adsorbents. Adsorption equilibrium stage wise and continuous contacting of fluid and solid phase.

TEXT BOOKS:

1. Mass Transfer Operations, R.E.Treybal, McGraw hill Book Company, New Delhi.
2. Mass Transfer by T.K.Sherwood, R.L.Pigford and C.P.Wilke. McGraw Hill (1975).

REFERENCE BOOKS:

1. Unit Operations of Chemical Engineering: W.L. McCabe and J.C. Smith, McGraw Hill, New Delhi.
2. Chemical Engineering: J.M. Coulson and J.F. Richardson Vol. 1, Pergamon, New York.

CHE-304 N	Chemical Reaction Engineering-II					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To understand the concept of semi batch reactor, non ideal reactor, catalyst and catalysis, porous catalyst and designing of fixed and packed back reactor.					
Course Outcomes						
CO1	To understand the concept semi batch reactor and models for non ideal raector.					
CO2	To understand the basic concept catalyst, types of catalyst and characteristics of catalyst					
CO3	To familiarize with the concept of porous solids and design for gas-liquid and gas-solid non-catalytic reactor					
CO4	To familiarize with the concept of design of fixed bed and packed bed reactor.					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT- I

Design equations for semi-batch reactor, concepts of non-ideality. Age Distribution function and interrelationship, Models for non-ideal flow patterns, estimation of parameters.

UNIT-II

Introduction to catalysis, Classification of catalysts. Preparation and physical characteristics of solid catalyst, concept of physical adsorption and chemisorptions.

UNIT-III

Diffusion of mass and heat in porous solids with and without external diffusion resistance, Effectiveness factor, Fluid- fluid reaction modeling based on film and penetration theory. Enhancement factor. Reactor system and design for gas-liquid and gas-solid non-catalytic systems.

UNIT- IV

Fixed bed catalytic reactors, single and multibed adiabatic reactors, multitublar fixed bed reactors. Design equations for fixed bed reactors using pseudo homogeneous one and two-dimensional models , Design aspects of fluidized bed reactors.

TEXT BOOKS:

1. Chemical Reaction Engineering: Octave LEVENSPIEL Whiley Eastern Limited, New Delhi.
2. Elements of Chemical Reaction Engineering, H.Scott Fogler- Prentice Hall of India Pvt. Ltd.New Delhi.

REFERENCE BOOKS:

1. Kinetics and mechanisms of Chemical Transformation, J. Rajaram and J.C. Kuriacose- MGH,N.Delhi.
2. Chemical Engineering Kinetics, J.M.Smith, McGraw Hill Book Company, New Delhi

CHE-306 N	Process Dynamics and Control					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To provide the knowledge and information about the laplace transformation, controllers, stability, Ziegler- Nichols Controller settings					
Course Outcomes						
CO1	To familiarize about the Laplace Transformation, first order systems and transportation lag					
CO2	To familiarize about Linear closed-loop systems, control systems, Controllers					
CO3	To understand the Stability, Routh Test of stability, Root Lacus					
CO4	To familiarize with the Controller tuning and testing of sine wave and step wave					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Laplace Transformation, Inversion by partial fractions. Properties of transform, Linear Open-loop System, Response of first-order systems, physical examples of first order system, response of first order systems and Transportation Lag.

UNIT-II

Linear closed-loop systems control systems, Controllers and Final control elements, closed-loop Transfer functions. Transient response of Simple control Systems Control valve, Construction, valve sizing and characteristics.

UNIT –III

Stability, Route Test of stability, Root Locus. Introduction to Frequency Response, Bode diagram, Gain Margins and Phase Margins.

UNIT –IV

Controller Tuning (Ziegler- Nichols Controller settings), Process identification, Identification methods: Step test data, Sine Wave testing, Pulse testing, Introduction to advanced control technique, cascade control, ratio control, overwrite control, feed forward control, Auto tuning.

TEXTBOOKS:

1. Process Systems Analysis and Control, D.R.Coughanowr McGraw Hill.
2. Essentials of Process Control: William Luyben, Michael L. Luyben McGraw Hill.

REFERENCE BOOKS:

1. Process Dynamics and Control, J.M.Douglas, Prentice Hall of India, New Delhi.
2. An Introduction to Process Dynamics and Control, T.W.Web John Wiley.
3. Chemical Process Control- An Introduction to Theory and Practice, G.Stephan Opoulos- PHI, New Delhi.

CHE-308 N	Numerical Methods in Chemical Engineering					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To understand the concept of types of errors, Eigen values and Eigen vectors of matrices, Non linear algebraic equations, Function evaluation, Ordinary differential equations					
Course Outcomes						
CO1	To Introduce the concept of error, linear algebraic equations					
CO2	To familiarize with the Eigen values and Eigen vectors of matrices, non linear algebraic equations					
CO3	To understand the Linear Regression, Interpolation and Extrapolation Technique					
CO4	To familiarize with the Ordinary Differential Equations					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Errors: Classification, significant digits and numerical stability.
Linear algebraic equations: Cramer's rule, Gauss Elimination and LU Decomposition Gauss-Jordan elimination, Gauss-Seidel and Relaxation Methods.

UNIT-II

Eigen values and eigenvectors of matrices: Faddeev Leverrier's Method, Power Method
Non linear algebraic equations: Single variable successive substitutions (Fixed Point Method), Multivariable successive substitutions, single variable Newton-Raphson Technique, Multivariable Newton-Raphson Technique.

UNIT-III

Function evaluation: Least squares curve-fit (Linear Regression), Newton's interpolation formulae (equal intervals), Newton's Divided Difference Interpolation Polynomial, Lagrangian Interpolation Unequal intervals), differentiation formulae, Integration formulae or Quadratures (Trapezoidal, Simpson's 1/3 and 3/8 rules), Extrapolation Technique of Richardson and Gaunt

UNIT-IV

Ordinary differential equations: Initial value problems; ode-ivps The Finite difference Technique

TEXT BOOKS

1. Numerical methods with programming in 'C', T. Veerarajan, and T. Ramachandran, TMGH(2007).
2. Numerical Methods for Scientists and Engineers , Sankara Rao K, 3rd edition PHI, New Delhi, (2007).

REFERENCE BOOKS:

1. Numerical Methods for Engineers, S.C. Chapra and R.P. Canale, 5th Edition, TMGH, New Delhi, 2007.
2. Numerical Methods in Engineering and Science, B.S. Grewal, and,J.S. Grewal, 6th Ed,Khanna Pub.2004.

CHE-310 N	Process Modeling					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To understand mathematical models of heat transfer, mass transfer, fluid flow, process dynamics and control					
Course Outcomes						
CO1	To understand the scope of mathematical model and transport equations					
CO2	To understand the mathematical model of batch reactor and multicomponent flash drum					
CO3	To understand Mathematical Modeling of Mass Transfer and Heat transfer Processes					
CO4	To familiarize with mathematical modeling of interacting and non interacting system					

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT-I

Introduction: Uses of mathematical models. Scope of coverage. Principles of formulations
Fundamental Laws: Continuity equations, energy equations, equations of motion, Transport equations, equation of state, equilibrium. Chemical kinetics.

UNIT-II

Mathematical Models: Series of isothermal CSTR & constant hold-up CSTR's, CSTR's With variable hold ups two heated tanks, gas phase pressurized CSTR' Non isothermal CSTR & single component vaporizer, multicomponent flash drum, batch reactor with Mass transfer.

UNIT –III

Mathematical Modeling of Mass Transfer and Heat transfer Processes: Ideal binary distillation column multi component non ideal distillation column, batch distillation with hold up, liquid extraction, absorption, adsorption, heat exchanger.

UNIT-IV

Interacting and Non-Interacting Systems: Real CSTR modeled with and exchange volume Real CSTR modeled using by passing and dead space. Two CSTR's with interchange.

TEXT BOOKS:
1. Process Modeling and Simulation Control for Chemical Engineering by luynben McGraw Hill.
2. Elements of Chemical Reaction Engineering by Fogler, prentice hall of India

REFERENCE BOOK:
1. Process optimization in chemical Engineer in by Edger Himmelblau.

CHE-312 N	Mass Transfer –II (P)					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
-	**-**	**3**	**60**	**40**	**100**	**3 (Hrs.)**
Purpose	To provide knowledge about operation of adsorption and absorption, solid- liquid extraction, distillation column					
Course Outcomes						
CO1	To understand Batch distillation equation for known number of plates					
CO2	To familiarize operation of adsorption and absorption					
CO3	To understand how to calculate number of plates in distillation column experimentally					
CO4	To understand the concept of solid- liquid extraction					

LIST OF EXPERIMENTS:

1. To estimate the batch distillation for a binary system and verify batch distillation equation for a known number of plate
2. To operate the column under different reflux conditions
3. To operate the column under total reflux conditions and estimate the minimum number of theoretical plates required
4. To calculate the percentage of recovery of phenol by using activated carbon as adsorbent
5. To study the effect of various system parameters like solvent temperature , solvent rate and particle size on the % recovery of oil from solid and determine the volume mass transfer coefficient in solid liquid extraction
6. To study absorption of CO_2 in aqueous NaOH solution in a sieve plate column
7. Calculate the overall mass transfer coefficient (absorption)

CHE-314 N	Chemical Reaction Engineering-II (P)					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
-	**-**	**3**	**60**	**40**	**100**	**3 (Hrs.)**
Purpose	To provide practical knowledge of the Trickle Bed Reactor, RTD curve for a Packed Bed Reactor, Saponification Reaction in PFR Reactor					
Course Outcomes						
CO1	Student will be able to determine hydrodynamics of Trickle Bed Reactor					
CO2	Student will be able to study the Saponification Reaction in PFR Reactor.					
CO3	Student will be able to determine the critical Reynolds's no. of a fluid flowing through a coil.					
CO4	Student will be able to study kinetics of Emulsion Polymerization of Styrene					

LIST OF EXPERIMENTS:

1. To Determine the hydrodynamics of Trickle Bed Reactor and involving the measurement of pressure drop holdup and flow regime
2. To Plot the RTD curve for a Packed Bed Reactor and determine the dispersion number
3. Performance of Semi-batch Reactor to Study the Second Order Saponification Reaction between Ethyl Acetate and NaOH
4. Study the Saponification Reaction in PFR Reactor and determine the reaction rate constant.
5. To Study the Saponification reaction in isothermal PFR and determine reaction rate constant
6. To determine the critical Reynolds's no. of a fluid flowing through a coil. To compare the pressure drop in a helical coil with that in straight pipe of same length inside diameter and surface roughness
7. To Study kinetics of Emulsion Polymerization of Styrene in Batch reactor under isothermal conditions

CHE-316 N	Process Dynamics and Control (P)					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
-	**-**	**2**	**60**	**40**	**100**	**3 (Hrs.)**
Purpose	To provide the practical knowledge of First Order Linear and non linear System, interacting and non interacting system, Dynamic characteristics of Control Valve					
Course Outcomes						
CO1	Students will be able to Compare dynamics of First Order and Second Order System Linear System					
CO2	Students will be able to know dynamics of First Order linear and non Linear System					
CO3	Students will be able to know dynamics of Interacting System and non interacting system.					
CO4	Students will be able to study Dynamic characteristics of Control Valve					

LIST OF EXPERIMENTS:

1. Comparison between dynamics of First Order and Second Order System Linear System
2. To Study dynamics of First Order Linear System
3. To Study dynamics of First Order Non Linear System
4. To Study dynamics of dynamics of Manometer
5. To Study dynamics of Non Interacting System
6. To Study dynamics of Interacting System
7. To Study dynamics of Level Trainer
8. To study the Dynamic characteristics of Control Valve
9. To Study dynamics of Temperature Trainer

CHE-318 N	Process Modeling (P)					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
-	**-**	**2**	**60**	**40**	**100**	**3 (Hrs.)**
Purpose	To provide the knowledge of mathematical modeling of mass transfer, heat transfer equipments and reactors in Chemical Reaction Engg.					
Course Outcomes						
CO1	Students will be able to know the concept of Drag coefficient, Sedimentation, Size reduction.					
CO2	Students will be able to know the principle and working of grinding in a ball mill, separation of dust particles from air and filtration of slurry.					
CO3	Students will be able to know the solid separation techniques and size distribution of particles					
CO4	Students will be able to determine the pressure drop in a packed bed.					

LIST OF EXPERIMENTS:

1. To Model and Simulate a Gravity Flow Tank Using Euler Integration
2. To Model and Simulate Three CSTR in Series Using Euler Integration
3. To Model and Simulate a Non Isothermal CSTR
4. To Model and Simulate Binary Distillation Column
5. To Model and Simulate a Batch Reactor
6. To Model and Simulate Two Non Interacting Tank in Series
7. To Model and Simulate Two Interacting Tank in Series

KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES/EXAMINATION

Bachelor of Technology (Civil Engineering)

Semester- V (w.e.f. session 2017-2018)

S. N.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hrs/ Wk	Theory	Sessional	Practical	Total	
1	CE-301N	Structural Analysis-III	4	2	0	6	75	25	0	100	3
2	CE-303N	Design of Concrete Structures-I	4	2	0	6	75	25	0	100	**4**
3	CE-305N	Hydrology	3	1	0	4	75	25	0	100	3
4	CE-307N	Geotechnology-I	3	1	0	4	75	25	0	100	3
5	CE-309N	Project Planning & Management	3	1	0	4	75	25	0	100	3
6	CE-311N	Concrete Technology	3	1	0	4	75	25	0	100	3
7	CE-313N	Structural Mechanics-II (P)	0	0	2	2	0	40	60	100	3
8	CE-315N	Concrete Technology (P)	0	0	2	2	0	40	60	100	3
9	CE-317N	Geotechnology (P)	0	0	2	2	0	40	60	100	3
10	CE-319N	Survey Camp / Field Training-I	1	0	0	1	0	0	100	100	
		Total	21	8	6	35	450	270	280	1000	

Survey Camp/Field Training-I undergone by the students after IV sem is to be evaluated during V sem as **(CE-319N)** through submission of certified report to the H.O.D. followed by conduct of viva-voce & seminar/presentation.

Semester- VI (w.e.f. session 2017-2018)

S. N.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hrs/ Wk	Theory	Sessional	Practical	Total	
1	CE-302N	Design of Steel Structures-II	4	2	0	6	75	25	0	100	3
2	CE-304N	Irrigation Engineering-I	3	2	0	5	75	25	0	100	3
3	CE-306N	Disaster Management	3	1	0	4	75	25	0	100	3
4	CE-308N	Geotechnology-II	3	2	0	5	75	25	0	100	3
5	CE-310N	Transportation Engineering- I	3	1	0	4	75	25	0	100	3
6	CE-312N	Water Supply & Treatment	3	1	0	4	75	25	0	100	3
7	CE-314N	Transportation Engg.- I (P)	0	0	2	2	0	40	60	100	3
8	CE-316N	Environmental Engg. - I (P)	0	0	2	2	0	40	60	100	3
9	CE-318N	CAD Lab	0	0	3	3	0	40	60	100	3
		Total	19	9	7	35	450	270	180	900	

Note: The students will have to undergo another six weeks **Field Training/Industrial Training** after VI sem and it will be evaluated during VII sem through submission of certified report to the H.O.D. followed by conduct of viva-voce & seminar/presentation.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-301N	**STRUCTURAL ANALYSIS-III**	**4**	**2**	**25**	**75**	**100**	**3 Hr**

Course Objective	Students will acquire the knowledge about the methods of analysis of different structures.

Unit	**Course Outcome**
I	Students will be able to study behavior in the form of S.F and B.M for continuous beams by influence line method
II	Students will be able to analyze the behavior of rolling load on structures and fixed arches
III	Students will be able to analyze the frames structures
IV	Students will be able to study about methods for stiffness and flexibility.

UNIT-I

Influence lines:

Introduction, influence lines for three hinged and two hinged arches, load position for Max. S.F. and B.M. at a section in the span.

Influence Line for statically indeterminate Beams:

Muller-Breslau Principle, I.L. for B.M. & S.F. for continuous Beams.

UNIT-II

Rolling Loads:

Introduction, Single concentrated load, uniformly distributed load longer than span, shorter than span, two point loads, several point loads, Max. B.M. and S.F. Absolute, Max. B.M.

Fixed Arches:

Expression for Horizontal Thrust and Bending Moment at a section, Elastic centre

UNIT-III

Kani's Method:

Analysis of continuous beams and simple frames, analysis of frames with different column lengths and end conditions of the bottom story.

UNIT-IV

Approximate Analysis of frames:

(i) For vertical loads, (ii) for lateral loads by Portal method & Cantilever method.

Matrix Methods

Introduction, Stiffness Coefficients, Flexibility Coefficients, development of flexibility & stiffness matrices for plane frame, Global axis and local axis, analysis of plane frame, pin jointed and rigid jointed.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books Recommended:

1. Indeterminate structures, R.L.Jindal S.Chand & Co.,N.Delhi.
2. Advanced Structural Analysis-A.K.Jain, Nem Chand & Bros.,Roorkee.
3. Structural Analysis-A Unified Approach, D.S. Prakash Rao,, University Press, Hyderabad.
4. Structural Analysis-A unified classical & Matrix Approach, A.Ghali & A.M. Neville, Chapman & Hall London.
5. Theory of Structures- Vol. I&II- S.P. Gupta & G.S.Pandit, Tata McGraw Hill, N.Delhi.
6. Basic Structural Analysis – C.S. Reddy, Tata McGraw Hill, New Delhi.
7. Structural Analysis –III, Amit Raheja. Professional Publication, Ambala cantt.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	**Time**
CE-303N	**DESIGN OF CONCRETE STRUCTURES-I**	**4**	**2**	**25**	**75**	**100**	**4 Hr**

Course Objective	To learn about the design of different types of structures by using reinforced cement concrete (RCC)
Unit	**Course Outcome**
I	Students will be able to study the design philosophies of different methods for RCC structures.
II	Students will be able to design of RCC beams using working stress and limit state method.
III	Students will be able to design of RCC columns and footing using working stress and limit state method.
IV	Students will be able to design of RCC slab and retaining walls and detailing of steel using working stress and limit state method.

UNIT-I

Elementary treatment of concrete technology:
Physical requirements of cement, aggregate, admixture and reinforcement, Strength and durability, shrinkage and creep. Design of concrete mixes, Acceptability criterion, I.S. Specifications,

Design Philosophies in Reinforced Concrete:
Working stress and limit state methods, Limit state v/s working stress method, Building code, Normal distribution curve, characteristic strength and characteristics loads, design values, Partial safety factors and factored loads, stress -strain relationship for concrete and steel.

UNIT-II

Working Stress Method:
Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular and flanged beams in flexure, steel beam theory, inverted flanged beams, design examples.

Limit State Method:
Basic assumptions, Analysis and design of singly and doubly reinforced rectangular flanged beams, minimum and maximum reinforcement requirement, and design examples.

UNIT-III

Analysis and Design of Sections in shear bond and torsion:
Diagonal tension, shear reinforcement, development length, Anchorage and flexural bond, Torsional, stiffness, equivalent shear, Torsional reinforcement, Design examples.

Columns and Footings:
Effective length, Minimum eccentricity, short columns under axial compression, Uniaxial and biaxial bending, slender columns, Isolated and wall footings, Design examples.

Serviceability Limit State:
Control of deflection, cracking, slenderness and vibrations, deflection and moment relationship for limiting values of span to depth, limit state of crack width, Design examples.

UNIT-IV

Concrete Reinforcement and Detailing:
Requirements of good detailing cover to reinforcement, spacing of reinforcement, reinforcement splicing, Anchoring reinforcing bars in flexure and shear, curtailment of reinforcement.

One way and Two Ways Slabs:
General considerations, Design of one way and two ways slabs for distributed and concentrated loads, Nonrectangular slabs, openings in slabs, Design examples.

Retaining Walls:
Classification, Forces on retaining walls, design criteria, stability requirements, Proportioning of cantilever retaining walls, counterfort retaining walls, criteria for design of counterforts, design examples.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections. **Time Duration: 4 Hours.**

Books:

1. Design of Reinforced Concrete Structures,P.Dayaratnam,Oxford & IBH Pub.,N.Delhi.
2. Reinforced Concrete-Limit State Design, A.K.Jain, Nem Chand & Bros.,Roorkee.
3. Reinforced Concrete, I.C.Syal & A,K,Goel, A.H,Wheeler & Co.Delhi.
4. Reinforced Concrfete Design, S.N.Sinha, TMH Pub.,N.Delhi.
5. SP-16(S&T)-1980, 'Design Aids for Reinforced Concrete to IS:456, BIS, N.Delhi.
6. SP-34(S&T)-1987 'Handbook on Concrete Reinforcement and Detailing', BIS, N.Delhi.
7. Reinforced Concrete Design – Pillai and Menon, TMH, New Delhi.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-305N	**HYDROLOGY**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Course Objective	Hydrology is the scientific study of the movement, distribution, and quality of water on Earth and other planets, including the water cycle, water resources and environmental watershed sustainability.

UNIT	Course Outcome
I	Students will be able to get better knowledge about the total precipitation in the particular area using different rain gauges
II	Students will be able to measure the evaporation, transpiration and infiltration and can analyze the measured data.
III	Students will be able to calculate the total runoff and able to draw hydrographs for the different durations of rainfall and can predict the future runoff.
IV	Students will be able to get the knowledge of ground water, its quality and efficiency of the ground storage.

UNIT-I

Introduction:
Hydrologic cycle, scope and application of hydrology to engineering problems, drainage basins and its characteristics, stream geometry, hypsometric curves.

Precipitation:
Forms and types of precipitation, characteristics of precipitation in India, measurement of Precipitation, recording and non-recording rain gauges, rain gauge station, rain gauge network, estimation of missing data, presentation of rainfall data, mean precipitation, depth -area –duration relationship, frequency of point rainfall, intensity-duration- frequency curves, probable max. precipitation.

UNIT-II

Evaporation & Transpiration:
Process, evaporimeters and empirical relationships, analytical method, reservoir evaporation and methods of its control, transpiration, evapotranspiration and its measurement, Penman's equation and potential evapotranspiration.

Infiltration:
Infiltration process, initial loss, infiltration capacity and measurement of infiltration, infiltration indices.

UNIT-III

Runoff:
Factor affecting run-off, estimation of runoff, rainfall-run off relationships, measurement of stage-staff gauge, wire gauge, automatic stage recorder and stage hydrograph, measurement of velocity-current meters, floats, area velocity method, moving boat and slope area method, electromagnetic, ultra-sonic and dilution methods of stream flow measurement, stage discharge relationship.

Floods and Flood Routing:
Flood frequency studies, recurrence interval, Gumbel's Method, flood routing, reservoir flood routing, channel flood routing and flood plain mapping.

Hydrograph:
Discharge hydrograph, components and factors affecting shape of hydrograph, effective rainfall, unit hydrograph and its derivation, unit hydrograph of different durations, use and limitations of UH, triangular UH, Snyder's synthetic UH, floods, rational methods, empirical formulae.

UNIT-IV

Ground Water:
Occurrence, types of aquifers, compressibility of aquifers, water table and its effects on fluctuations , wells and springs, movement of ground water, Darcy's law, permeability and its determination, porosity, specific yield and specific retention, storage coefficient, transmissibility.

Ground Water Quality:
Indian and International standards, pollution of ground water and possible source, remedial and preventive measures.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books:

1. Engineering Hydrology by K.Subramanya, TMH, New Delhi
2. Hydrology by H.M.Raghunath.
3. Hydrology for Engineers by Linsely, Kohler, Paulhus.
4. Elementary Hydrology by V.P.Singh.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-307N	**GEOTECHNOLOGY-I**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Course Objective	The subject gives a better idea about the soil and its properties & also design of types of foundation.

UNIT	**Course Outcome**
I	Students will be able to study the sub-surface soil and its properties and methods of sampling and testing.
II	Students will be able to study the different types of shallow foundation and its design.
III	Students will be able to study the different types of pile foundation and its design.
IV	Students will be able to study the different types of. Drilled Piers and Caisson Foundations and their design.

UNIT-I

Sub-Surface Exploration: Purpose, stages in soil exploration, depth and lateral extent of exploration, guidelines for various types of structures, ground water observations, excavation and boring methods, soil sampling and disturbance, major types of samplers, sounding methods-SCPT, DCPT, SPT & interpretation, geo-physical methods, pressure-meter test, exploration logs.
Drainage & Dewatering: Introduction, ditches and sumps, well point systems, shallow well system, deep well drainage, vacuum method, Electro-osmosis, consolidation by sand piles, Eductor method.

UNIT-II

Shallow Foundations-I: Design criteria for structural safety of foundation (i) location of footing, (ii) shear failure criterion, (iii) settlement criterion, ultimate bearing capacity, modes of shear failure, Rankine's analysis Tergazi's theory, Skempton's formula, effect of fluctuation of G.W.T. , effect of eccentricity on bearing capacity, I.S Code recommendations, factors affecting bearing capacity, methods of improving bearing capacity.
Shallow Foundations-II: Various causes of settlement of foundation, allowable bearing pressure based on settlement, settlement calculation, elastic and consolidation settlement, allowable settlement according to
I.S.Code. Plate load test and its interpretation, bearing capacity from penetration tests, design bearing capacity.
Shallow Foundations-III: Situation suitable for the shallow foundations, types of shallow foundations and their relative merits, depth of foundation, footing on slopes, uplift of footings, conventional procedure of proportioning of footings, combined footings, raft foundations, bearing capacity of raft in sands and clays, various methods of designing rafts, floating foundations.

UNIT-III

Pile Foundations-I: Introduction, necessity of pile foundations, classification of piles, load capacity, static analysis, analysis of pile capacity in sands and clays, dynamic analysis, pile load tests, negative skin friction, batter piles, lateral load capacity, uplift capacity of single pile, under-reamed pile.
Pile Foundations-II: Group action in piles, pile spacing, pile group capacity, stress on lower strata, settlement analysis, design of pile caps, negative skin friction of pile group, uplift resistance of pile group, lateral resistance, batter pile group.

UNIT-IV

Drilled Piers and Caisson Foundations: Drilled piers-types, uses, bearing capacity, settlement, construction procedure.
Caissons-Types, bearing capacity and settlement, construction procedure. well foundations-shapes, depth of well foundations, components, factors affecting well foundation design lateral stability, construction procedure, sinking of wells, rectification of tilts and shifts, recommended values of tilts & shifts as per I.S.3955.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books Recommended:

1. Analysis and Design of Foundation and Retaining Structures by S. Prakash, Gopal Ranjan & S.Saran, Sarita Prakashan.
2. Analysis and Design of Sub Structures by Swami Saran, IBH Oxford
3. Basic and Applied Soil Mechanics by Gopal Ranjan and ASR Rao, Newage Int.Pub.
4. Soil Dynamic by Shamsher Prakash, McGraw Hill
5. Foundation Design by Teng, Prentice Hall
6. Soil Mechanics & Foundation Engineering by Bharat Singh, Shamsher Prakash, Nem Chand & Bros, Roorkee.
7. Soil Mechanics and Foundation Engineering by Alam Singh.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-309N	**PROJECT PLANNING & MANAGEMENT**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Course Objective	To have better understanding about the planning and management of construction. Projects.

UNIT	**Course Outcome**
I	Students will be able to study the construction contracts and their management.
II	Students will be able to plain the construction projects and job layout.
III	Students will be able to study the time management of the construction projects by different methods.
IV	Students will be able to study the cost management and quality control analysis of the construction projects.

UNIT-I

Construction Management

Significance, objectives and functions of construction management, types of constructions, resources for construction industry, stages for construction, construction team, engineering drawings.

Construction Contracts & Specifications

Introduction, types of contracts, contract document, specifications, important conditions of contract, arbitration.

UNIT-II

Construction Planning

Introduction, work breakdown structure, stages in planning-pre-tender stages, contract stage, scheduling, scheduling by bar charts, preparation of material, equipment, labour and finance schedule, limitation of bar charts, milestone charts.

Construction Organization

Principles of Organization, communication, leadership and human relations, types of Organizations, Organization for construction firm, site organization, temporary services, job layout.

UNIT-III

Network Techniques in Construction Management-I: CPM

Introduction, network techniques, work break down, classification of activities, rules for developing networks, network development-logic of network, allocation of time to various activities, Fulkerson's rule for numbering events, network analysis , determination of project schedules, critical path, ladder construction, float in activities, shared float, updating, resources allocation, resources smoothing and resources leveling.

Network Techniques in Construction Management-II-PERT

Probability concept in network, optimistic time, pessimistic time, most likely time, lapsed time, deviation, variance, standard deviation, slack critical path, probability of achieving completion time, central limit theorem.

UNIT-IV

Cost-Time Analysis

Cost versus time, direct cost, indirect cost, total project cost and optimum duration, contracting the network for cost optimization, steps in time cost optimization, illustrative examples.

Inspection & Quality Control

Introduction, principles of inspection, enforcement of specifications, stages in inspection and quality control, testing of structures, statistical analysis.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books Recommended

1. Construction Planning & Management by P.S.Gehlot & B.M.Dhir, Wiley Eastern Ltd.
2. PERT & CPM -Principles & Applications by L.S.Srinath. Affiliated East-west Press (P)Ltd.
3. Project Planning & Control with PERT & CPM by B.C.Punmia & K.K.Khandelwal,Lakshmi Pub. Delhi
4. Construction Management & Planning by B.sengupta & H.Guha, Tata McGraw -Hills.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-311N	**CONCRETE TECHNOLOGY**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Course Objective	To have better understanding about the various properties of materials and ingredients of concrete.

UNIT	**Course Outcome**
I	Students will be able to study the construction materials like Cement & Aggregates and its properties
II	Students will be able to design concrete and perform test on concrete on various strength parameters, modifying its properties using other substances.
III	Students will be able to study various effects on concrete & its non-destructive tests for properties evaluation.
IV	Students will be able to study about methods of repairing and design of special concrete.

UNIT-I

Introduction: Introduction of Concrete, preparation of concrete, grades of concrete, advantages of concrete, concept of quality control.

Cement: Introduction of Cement, ingredient in cement. basic chemistry, types of cement, ordinary Portland cement, rapid hardening cement, low heat cement, sulphate resistant cement, Portland-pozzolona cement, high strength Portland cement, high alumina cement, waterproof cement, white Portland cement, hydrophobic cement, colored Portland cement, Field and laboratory tests on cement. Pozzolanic materials, Fly ash, metakaoline, GGBS, iron slag, rise husk ash - its types, properties, applications & limitations.

Aggregates: Aggregates, classification of aggregates based on petrography, size, shape and textures, deleterious substances in aggregates, bulking of fine aggregates, sieve analysis, grading of aggregates as per IS-383-1970, fineness modulus, Maximum size of aggregate, Quality of mixing water, curing water.

UNIT-II

.**Production of Concrete:** Introduction, Design of mix by IS & ACI methods including batching of materials, mixing of concrete materials, transportation of concrete, compaction of concrete, ready mixed concrete, vibrators, Internal vibrators, external vibrators, concrete curing and formwork removal.

Properties of Concrete: Introduction, workability, factors influencing workability, measurement of workability, requirements of workability, properties of hardened concrete, stress and strain characteristics of concrete, Young's modulus of concrete, creep and shrinkage of concrete, permeability of concrete, durability of concrete sulphate attack, fire-resistance, thermal properties of concrete, construction joints, expansion and contraction joints.

UNIT-III

Non-Destructive Testing of Concrete: Significance of Non-Destructive Testing, Rebound Hammer, Ultrasonic pulse velocity techniques, Penetration techniques, pullout tests, vibration methods, radioactive techniques, Cover meter, core-tests.

Deterioration of Concrete & its Prevention: Causes of concrete deterioration, deterioration by water, surface weir, frost action, deterioration by chemical reactions, sulphate attack, alkali-aggregate reaction, corrosion of embedded steel in concrete, Prevention of deterioration of concrete.

UNIT-IV

Repair Technology for Concrete Structures: Symptoms and diagnosis of distress, evaluation of cracks, repair of cracks, common types of repairs, distress in fire damaged structures, underwater repairs.

Special Concrete: Light weight concrete, definition and its properties, applications, high strength concrete, definitions, its properties and applications, Mass Concrete, waste material based concrete, shortcrete, fiber reinforced concrete: Materials Fibres types and properties, ferrrocement, polymer concrete composites, heavy weight concrete for radiation shielding.

Prestressed Concrete: Introduction, basic concepts, classifications and types of prestressing, prestressing systems, and properties of materials, pre tensioned and post tensioned concrete elements.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

TEXT BOOKS

1. Neville A M and Brookes J J "Concrete Technology" Pearson Publishers, New Delhi, 1994.
2. Neville A M "Properties of Concrete" Pearson Publishers, New Delhi, 2004.
3. Gambhir M L "Concrete Technology" Tata McGraw Hill, New Delhi, 1995.
4. Shetty M S "Concrete Technology" S. Chand & Company, New Delhi, 2002.
5. Mehta P K "Microstructure of Concrete" Indian Concrete Institute and ACC, Bombay.

Code	Nomenclature of Practical	P	External	Sessional	Total	Time
CE-313N	**STRUCTURAL MECHANICS –II (P)**	**2**	**60**	**40**	**100**	**3H**
Course Objective	To make students acquire the knowledge of methods of analysis of structure fitness for use, physical test and determining the effects of load in a structure					

LIST OF EXPERIMENTS

1. Experiment on a two hinged arch for horizontal thrust & influence line for Horizontal thrust
2. Experimental and analytical study of a 3-bar pin-jointed Truss.
3. Experimental and analytical study of deflections for unsymmetrical bending of a Cantilever beam.
4. Begg's deformeter- verification of Muller Breslau principle.
5. Experimental and analytical study of an elastically coupled beam.
6. Determine the Forces in members of redundant frames.
7. Sway in portal frames - demonstration.

References:

1. A Laboratory Manual on Structural Mechanics by Dr. Harwinder Songh; New Academic Publishing Comp. Ltd.

Code	Nomenclature of Practical	P	External	Sessional	Total	Time
CE-315N	**CONCRETE TECHNOLOGY (P)**	**2**	**60**	**40**	**100**	**3H**
Course Objective	To have better understanding about the various properties of materials used for preparation of concrete, Design of concrete by IS method and different tests to evaluate the strength of concrete.					

LIST OF EXPERIMENTS

1. To determine the standard consistency and initial and final setting time of cement using Vicat's apparatus.
2. To determine the Fineness of cement by Sieve analysis and Blaine's air permeability method.
3. To determine the (1) specific gravity of cement (2) Soundness of cement by Le Chatelier's apparatus.
4. To determine the Compressive strength of cement.
5. To Determine the Fineness Modulus, Bulk Density, Water Absorption and Specific gravity of Fine Aggregates.
6. To Determine the Fineness Modulus, Bulk Density, Water Absorption and Specific gravity of Coarse Aggregates.
7. Mix Design of Concrete by IS methods.
8. Workability of cement concrete by (1) Slump test, (2) Compaction factor test, (3) Flow table test.
9. To Determine the Compressive strength of concrete by (1) Cube test, (2)Cylinder test.
10. To Determine the Split Tensile and Flexural strength of Concrete.
11. To Determine the Bond strength between steel bar and concrete by pull-out test.
12. To evaluate the Non-destructive testing of concrete by (1) Rebound hammer, (2) ultrasonic pulse velocity test.
13. To Determine the Compressive strength of Brick and Tile as IS standard.

Books Recommended:

1. Concrete Manual-M.L.Gambhir, Dhanpat Rai & Sons, N.Delhi.
2. Concrete Technology-M.L.Gambhir, Tata McGeraw Hill, N.Delhi.
3. Concrete Technology – Nevellie, Pearson Education.

Code	Nomenclature of Practical	P	External	Sessional	Total	Time
CE-317N	**GEOTECHNOLOGY (P)**	**2**	**60**	**40**	**100**	**3H**
Course Objective	The subject gives better idea about the soil and its properties which are very useful in design of types of foundation.					

LIST OF EXPERIMENTS

1. Grain Size Analysis-Hydrometer method.
2. Shrinkage Limit Determination.
3. Relative Density of Granular Soils.
4. Consolidated Drained (CD) Triaxial Test.
5. Consolidated Undrained (CU) Triaxial Test with Pore Water Pressure measurement.
6. Consolidation Test.
7. Undisturbed Sampling.
8. Standard Penetration Test.
9. Dynamic Cone Penetration Test.
10. Model Plate Load Test.

Books:

1. Soil Testing for Engineers by S.Prakash & P.K.Jain, Nem Chand & Bros.,Roorkee.
2. Engineering Soil Testing by Lambi, Wiley-Eastern.
3. Engineering Properties of Soils & Their Measurement by JE Bowles, McGraw -Hill.
4. Soi l Engineer ing in Theory & Pract ice by Alam Singh, Vol. II, Geotechnical Testing & Instrumentation, CBS Pub.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-302N	**DESIGN OF STEEL STRUCTURES-II**	**4**	**2**	**25**	**75**	**100**	**3 Hr**

Course Objective	To Impart knowledge and ability to design various steel structures.

UNIT	**Course Outcome**
I	Students will be able to familiar with the Elementary Plastic Analysis and Design of steel structures.
II	Students will be able to design steel water tank and steel stacks and their stability checks.
III	Students will be able to design steel towers and Cold Formed Sections and their stability checks.
IV	Students will be able to design steel industrial building and their stability checks.

UNIT-I

Elementary Plastic Analysis and Design:

Introduction, Scope of plastic analysis, ultimate load carrying capacity of tension members and compression members, flexural members, shape factor, mechanisms, plastic collapse, analysis, plastic analysis applied to steel beams and simple portal frames and design.

UNIT-II

Design of Water Tanks:

Introduction, permissible stresses, design of circular, rectangular and pressed steel tanks including staging.

Design of Steel Stacks:

Introduction, various loads to be considered for the design of steel stacks, design of steel stacks including foundation.

UNIT-III

Towers:

Transmission line towers, microwave towers, Design loads, classification, design procedure and specification.

Cold Formed Sections:

Introduction and brief description of various types of cold formed sections, local buckling, concepts of effective width and effective sections, elements with stiffeners, design of compression and bending elements.

UNIT-IV

Industrial Buildings:

Loads, general arrangement and stability, design considerations, design of purlins, design of roof trusses, industrial building frames, bracings and stepped columns.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books:

1. Design of Steel Structures, A.S.Arya & J.L.Ajmani, Nem Chand & Bros., Roorkee.
2. Design of Steel Structures, P.Dayartnam, Wheeler Pub. Allahabad.
3. Design of Steel Structures, Gaylord & Gaylord, MGH, Newyork/International Students Ed.
4. IS:800-1984, Indian Standard Code of Practice for General Construction in Steel.
5. IS-801-1975, Indian Standard Code of Practice for Use of Cold formed light gauge steel structural members in general building construction.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-304N	**IRRIGATION ENGINEERING-I**	**3**	**2**	**25**	**75**	**100**	**3 Hr**

Course Objective	To Impart knowledge irrigation water requirement and ability to understand the hydraulic structures.

UNIT	**Course Outcome**
I	Students will be able to understand water requirement of crops and methods of irrigation.
II	Students will be able to study the canals, its types and also design of lined canals.
III	Students will be able to study about losses and water logging and its techniques.
IV	Students will be able to study about canal outlet, its design and ground water irrigation.

UNIT-I

Introduction: Irrigation-necessity, advantages, disadvantages, impact of irrigation on human environment , need and development of irrigation in India, crops and crop seasons, ideal cropping pattern and high yielding varieties of crops.

Soil-water relationship and irrigation methods: Soil-water relationship, root zone soil water, infiltration, consumptive use, field capacity, wilting point, available moisture in soil, GCA, CCA, intensity of irrigation, delta, base period, Kor depth, core period, frequency of irrigation, duty of water, relation between delta, duty and base period, irrigation requirement, flooding methods, border strip method, check basin and furrow method, assessment of irrigation water, sprinkler irrigation, favorable conditions, sprinkler systems, hydraulics of sprinkler irrigation, planning, design and maintenance of sprinkler systems, drip irrigation-components parts, advantages and limitations, suitability of drip irrigation.

UNIT-II

Canal irrigation: Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Silt theories-Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories..

Lined canals: Types of lining, selection of type of lining, Economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining.

UNIT-III

Losses in canals, water logging and drainage: Losses in canals-Evaporation and seepage, water logging, causes and ill effects of water logging anti water logging measures. Drainage of land, classification of drains - surface and subsurface drains, Design considerations for surface drains, Advantages and maintenance of tile drains.

River Training work: Classification of rivers, river training and its objectives, classification of river training works, methods of river training, marginal embankments, guidebanks, spurs, cutoffs, bank pitching and launching apron.

UNIT-IV

Canal outlets: Classification, requirements of a good outlet, design of pipe, APM and open flume outlet, flexibility proportionality, setting and sensitivity of outlet.

Tube-well irrigation: Types of tube wells - strainer type, cavity type and slotted type. Type of strainers, Aquifer, porosity, uniformity coefficient, specific yield & specific retention, coefficients of permeability, transmissibility and storage. Yield or discharge of a tube well, Assumptions, Theim's & Dupuit's formulae, Limitations of Theim's and Dupuit's formulae. Interference of tube wells with canal or adjoining tube-wells, causes of failure of tubewells, optimum capacity, Duty and delta of a tube well. Rehabilitation of tubewell.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books:

1. Irrigation, Water Resources and Water Power Engg. by P.N.Modi.
2. Fundamentals on Irrigation Engg. by Bharat Singh.
3. Irrigation Engg & Hydraulic Structures by S.K.Garg.
4. Irrigation Engg. by S.K.Sharma.
5. Irrigation-Theory & Practice by A.M. Michael.
6. Irrigation – Theory & Practice by G.L. Asawa.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-306N	**DISASTER MANAGEMENT**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Course Objective	To Impart knowledge about Disaster management and design & planning to control the accidents.

UNIT	**Course Outcome**
I	Students will be able to study about Disaster and their types.
II	Students will be able to study about assessment of disaster and management of its control.
III	Students will be able to understand the building structures and their efficiency to control hazard.
IV	Students will be able to study the efficient structures and analysis of Hazard by case study.

UNIT-I

Introduction to Disaster Management: Define and describe disaster, hazard, emergency, vulnerability, risk and disaster management; Identify and describe the types of natural and non-natural disasters. Important phases of Disaster Management Cycle.

Disaster Mitigation and Preparedness: Natural Hazards: causes, distribution pattern, consequences and mitigation measures for earth quake, tsunami, cyclone, flood, landslide drought etc. Man-made hazards: causes, consequences mitigation measures for various industrial hazards/disasters, Preparedness for natural disasters in urban areas.

UNIT-II

Hazard and Risk Assessment: Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems.

Emergency Management Systems (EMS): Emergency medical and essential public health services, response and recovery operations, reconstruction and rehabilitation.

UNIT-III

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management, role of media in effective disaster management, overview of disaster management in India, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines..

Application of Geo-informatics and Advanced Techniques: Use of Remote Sensing Systems (RSS) and GIS in disaster Management, role of knowledge based expert systems in hazard scenario, using risks-time charts to plan for the future, early warning systems.

UNIT-IV

Integration of public policy: Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.

Case Studies: Lessons and experiences from various important disasters with specific reference to Civil Engineering.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books/References:

1. Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill. Pub
2. Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester
3. Disaster Management, R.B. Singh (Ed), Rawat Publications
4. ESCAP: Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction.
5. www.http//ndma,gov,in
6. Disaster Management –Future Challenges & Opportunities by Jagbir Singh, I.K. International Publishing House.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-308N	**GEOTECHNOLOGY-II**	**3**	**2**	**25**	**75**	**100**	**3 Hr**

Course Objective	To Impart knowledge of earth soil and its structures and also the stability of earth structures.

UNIT	**Course Outcome**
I	Students will be able to study about earth dams and stability of slopes.
II	To study about braced cuts and coffer dams, their design and stability.
III	To study about stabilization of soil masses by using sheet piles.
IV	To study the methods of Soil Stabilization and machine tools

UNIT-I

Earth Dams: Introduction, types of sections, earth dam foundations, causes of failure and criteria for safe design, control of seepage through the embankment, control of seepage through the foundation, drainage of foundations, and criterion for filter design. Introduction to rock fill dams.

Stability of slopes: Causes of failure, factors of safety, stability analysis of slopes-total stress analysis, effective stress analysis, stability of infinite slopes types of failures of finite slopes, analysis of finite slopes-mass procedure, method of slices, effect of pore pressure, Fellinius method to locate center of most critical slip circle, friction circle method, Tayler's stability number, slope stability of earth dam during steady seepage, during sudden draw down and during and at the end of construction.

UNIT-II

Braced Cuts: Depth of unsupported vertical cut, sheeting and bracing for deep excavation, movements associated with sheeting and bracing, modes of failure of braced cuts, pressure distribution behind sheeting.

Cofferdams: Introduction, types of cofferdams, design and lateral stability of braced cofferdams, design data for Cellular cofferdams, stability analysis of cellular cofferdams on soil and rock, inter-lock stresses.

UNIT-III

Cantilever Sheet Piles: Purpose of sheet piles, cantilever sheet piles, depth of embedment in granular soils-rigorous method, simplified procedure, cantilever sheet pile, penetrating clay and limiting height of wall.

Anchored Bulkheads: Methods of design, free earth support method in cohesionless and cohesive soils, fixed earth support method in cohesionless soils-Blum's equivalent beam method.

UNIT-IV

Soil Stabilization: Soil improvement, shallow compaction, mechanical treatment, use of admixtures, lime stabilization, cement stabilization, lime fly ash stabilization, dynamic compaction and consolidation, bituminous stabilization, chemical stabilization, pre-compression, lime pile and column, stone column, grouting, reinforced earth.

Basics of Machine Foundations: Terminology, characteristics elements of a vibratory systems, analysis of vibratory motions of a single degree freedom system-undamped free vibrations, undamped forced vibrations, criteria for satisfactory action of a machine foundation, degrees of a freedom of a block foundation, Barken's soil spring constant, Barken's method of a determining natural frequency of a block foundation subjected to vertical oscillations.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books Recommended:

1. Analysis and Design of Foundation and Retaining Structures by S. Prakash, Ranjan & S.Saran, Sarita Prakashan.
2. Analysis and Design of Sub Structures by Swami Saran, IBH Oxford
3. Basic and Applied Soil Mechanics by Gopal Ranjan and ASR Rao, Newage Int.Pub.
4. Soil Dynamic by Shamsher Prakash, McGraw Hill
5. Foundation Design by Teng, Prentice Hall
6. Soil Mechanics & Foundation Engineering by Bharat Singh, Shamsher Prakash, Nem Chand & Bros, Roorkee.
7. Soil Mechanics and Foundation Engineering by Alam Singh.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-310N	**TRANSPORTATION ENGINEERING -I**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Course Objective	The study of safe & optimum geometric design of highways & fundamental parameters of highway materials.
UNIT	**Course Outcome**
I	Students will able to study the history review of roads and development of their concern authorities.
II	Students will study about geometric design and their cross sectional elements of highways.
III	Students will study about regulation and safe movements of the traffic.
IV	Students will study about different fundamental parameters of highway materials.

UNIT-I

Introduction: Transportation and its importance. Different modes of transportation. Brief review of history of road development in India and abroad: Roman, Tresagne, Telford and Macadam constructions. Road patterns. Classification of roads, Objectives of highway planning, Planning surveys. Saturation system of planning.

Highway Plans, Highway Alignment and Surveys: Main features of 20 years road development plans in India. Requirements of an ideal highway alignment. Factors affecting alignment. Surveys for highway alignment.

UNIT-II

Cross Section Elements and Sight Distance Considerations: Cross section elements: friction, carriageway, formation width, land width, camber, IRC recommended values. Types of terrain Design speed. Sight distance, stopping sight distance, overtaking sight distance, overtaking zones, intermediate sight distance, sight distance at intersections, head light sight distance, set back distance. Critical locations for sight distance.

Design of Horizontal and Vertical Alignment: Effects of centrifugal force. Design of super-elevation. Providing super-elevation in the field. Radius of circular curves. Extra-widening. Type and length of transition curves. Gradient, types, values. Summit curves and valley curves, their design criterion. Grade compensation on curves.

UNIT-III

Traffic Characteristics and Traffic Surveys: Road user and vehicular characteristics. Traffic studies such as volume, speed and O & D study. Parking and accident studies. Fundamental diagram of traffic flow. Level of service. PCU. Capacity for non-urban roads. Causes and preventive measures for road accidents.

Traffic Control Devices: Traffic control devices: signs, signals, markings and islands. Types of signs. Types of signals. Design of an isolated fixed time signal by IRC method. Intersections at grade and grade separated intersections. Design of a rotary. Types of grade separated intersections.

UNIT-IV

Highway Materials: Soil and Aggregates: Subgrade soil evaluation: CBR test, plate bearing test. Desirable properties of aggregates. Various tests, testing procedures and IRC/IS specification for suitability of aggregates. Proportioning of aggregates for road construction by trial and error and Routhfuch method.

Bituminous Materials and Bituminous Mixes: Types of bituminous materials: bitumen, tar, cutback and emulsions. Various tests, testing procedures and IRS/IS specifications for suitability of bituminous materials in road construction. Bituminous mix, desirable properties. Marshall' method of mix design. Basic concept of use of polymers and rubber modified bitumen in bituminous mixes.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books:

1. Highway Engg. by S.K.Khanna & C.E.G.Justo, Nem Chand & Bros,Roorkee.
2. Principles of Transportation and Highway Engg. by G.V.Rao,Tata McGraw Hill Pub., N.Delhi.
3. Traffic Engg. And Transport Planning by L.R.Kadiyali,Khanna Pub.Delhi.
4. Traffic Engg. by Matson, T.M.,Smith,W.S. and Hurd,P.W.McGraw Hill Book Co., New York.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
CE-312N	**WATER SUPPLY AND TREATMENT**	**3**	**1**	**25**	**75**	**100**	**3 Hr**

Course Objective	The aim of study is the water requirement, quantity, its properties and its distribution.
UNIT	**Course Outcome**
I	Students will study the quantity requirement of the water for supply.
II	Students will study the physical, chemical and bacteriological properties of water.
III	Students will study the methods of treatment of water.
IV	Students will study the methods to supply the water for different purpose.

UNIT-I

Water Quantity:

Importance and necessity of water supply scheme. Water demands and its variations. Estimation of total quantity of water requirement. Population forecasting. Quality and quantity of surface and ground water sources. Selection of a source of water supply. Types of intakes.

UNIT-II

Water Quality:

Impurities in water and their sanitary significance. Physical, chemical and bacteriological analysis of water. Water quality standards.

UNIT-III

Water Treatment:

Objectives, treatment processes and their sequence in conventional treatment plant, sedimentation – plain and aided with coagulation. Types, features and design aspects. Mixing basins and Flocculation units. Filtration – mechanism involved, types of filters, slow and rapid sand filtration units (features and design aspects). Disinfection principles and aeration.

UNIT-IV

Water Distribution:

Distribution system – Gravity system, Pumping System, Dual system, Layout of Distribution System – Dead End System, Grid Iron System, Ring System, Radial System, their merits and demerits. Distribution Reservoir-functions & determination of storage capacity.

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two questions from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

Books:

1. Water Supply and Sewerage: E.W. Steel.
2. Water Supply Engineering: S.R. Kshirsagar.
3. Water Supply Engineering: S.K. Garg.
4. Water Supply Engineering: B.C. Punmia.
5. Manual on Water Supply and Treatment: Ministry of Urban Dev., New Delhi.

Code	Nomenclature of Practical	P	External	Sessional	Total	Time
CE-314N	**TRANSPORTATION ENGINEERING-I (P)**	**2**	**60**	**40**	**100**	**3H**
Course Objective	The aim of study is to determine the different properties of highway construction materials.					

LIST OF EXPERIMENTS

1. To determine the toughness of the aggregate by aggregate Impact Test.
2. To determine the hardness of the aggregate by Los-Angeles Abrasion Test.
3. To determine the hardness of the aggregate by Dorry's Abrasion Test on Aggregates.
4. To determine the hardness of the aggregate by Deval Attrition Test on Aggregates.
5. To determine the Crushing Strength Test on Aggregates.
6. To determine the grade and hardness of the bitumen by Penetration Test.
7. To determine the elastic property of the bitumen by Ductility Test.
8. To determine the grade and hardness of the bitumen by Viscosity Test.
9. To determine the Softening Point Test on Bitumen.
10. To determine the Flash and Fire Point Test on Bitumen.

Code	Nomenclature of Practical	P	External	Sessional	Total	Time
CE-316N	**ENVIRONMENTAL ENGINEERING-I (P)**	**2**	**60**	**40**	**100**	**3H**
Course Objective	To Impart knowledge of quality and mineral composition of drinking water supply.					

LIST OF EXPERIMENTS

1. To determine the pH value of a given sample of water waste water.
2. To determine the turbidity in given water waste water sample.
3. To determine the acidity of given sample of water waste water.
4. To determine the alkalinity of given sample of water waste water.
5. To determine temporary and permanent hardness in a given water sample.
6. To determine the chlorine does required for a given water sample.
7. To determine total suspended, suspended, dissolved settable solids in a sewage sample.
8. To determine the chloride concentration in a given sample of waste water.
9. To determine the sulphate concentration in given water sample.

Code	Nomenclature of Practical	P	External	Sessional	Total	Time
CE-318N	**CAD Lab**	**3**	**60**	**40**	**100**	**3H**
Course Objective	The students will able to understand the 3D structures and prepaid drawing in cad					

LIST OF EXPERIMENTS

PART-A

Detailed drawing of the following reinforced concrete structures:

1. Footings: Isolated footings**,** combined footings, rectangular, trapezoidal, strip, strap, raft footings
2. Domes: Spherical and conical domes.
3. Water tanks: rectangular, cylindrical, Intz type overhead water tank.
4. RCC Flat slabs
5. Masonary columns, bearing walls, retaining walls.

PART-B

Detailed design and drawing of the following steel structures:

1. Columns, base plates and their foundations
2. Plate Girder (welded)
3. Gantry Girder
4. Simple roof trusses.

KURUKSHETRA UNIVERSITY KURUKSHETRA

SCHEME OF STUDIES / EXAMINATIONS

Bachelor of Technology (Information Technology)

Semester – V (w.e.f. Session 2017-18)

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hours/ Week	Theory	Sessional	Practical	Total	
1.	IT-301N	Linux Operating System	4	1	--	5	75	25	--	100	3
2.	IT-303N	Introduction to Digital & Data Communication	4	--	--	4	75	25	--	100	3
3.	IT-305N	JAVA Programming	4	1	--	5	75	25	--	100	3
4.	IT-307N	Multimedia & Virtual Reality	4	--	--	4	75	25	--	100	3
5.	IT-309N	Computer Graphics	4	1	--	5	75	25	--	100	3
6.	IT-311N	Computer Graphics Lab	--	--	3	3	---	40	60	100	3
7.	IT-313N	Multimedia Lab	--	--	2	2	---	40	60	100	3
8.	IT-315N	JAVA Programming Lab	--	--	3	3	---	40	60	100	3
9.	IT-317N	Linux Lab	----	--	2	2	--	40	60	100	3
10.	IT-319N	Industrial Training-I	1	--	---	1	---	100	----	100	
		Total	**21**	**3**	**10**	**34**	**375**	**385**	**240**	**1000**	

Note: Industrial Training which was undergone by the students after IV sem is to be evaluated during V sem as **(IT-319N)** through submission of certified computerized report to the Head of the Department followed by viva-voce, seminar/presentation.

Semester – VI (w.e.f. Session 2017-18)

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hours/ Week	Theory	Sessional	Practical	Total	
1.	IT-302N	Analysis & Design of Algorithms	4	1	-	5	75	25	--	100	3
2.	IT-304N	Software Engineering	4	--	-	4	75	25	--	100	3
3.	IT-306N	Computer Networks	4	--	--	4	75	25	--	100	3
4.	IT-308N	Introduction to Microcontroller	4	--	--	4	75	25	--	100	3
5.	IT-310N	Data Warehouse & Data Mining	4	1	--	5	75	25	--	100	3
6.	IT-312N	Software Engineering Lab	---	--	2	2	---	40	60	100	3
7.	IT-314N	Networking Lab	--	--	2	2	---	40	60	100	3
8.	IT-316N	Visual *Basic.net* Lab	--	--	3	3	---	40	60	100	3
9.	IT-318N	Microcontroller Lab	--	--	2	2	---	40	60	100	3
10.	IT-320N	Colloquium & Professional Proficiency	---	--	2	2	--	100	--	100	--
		Total	**20**	**2**	**11**	**33**	**375**	**385**	**240**	**1000**	--

Note: The students will have to undergo another six weeks Industrial Training after VI sem and it will be evaluated during VII sem through submission of certified computerized report to the Head of the Department followed by viva-voce, seminar/presentation.

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IT-301 N	Linux Operating System					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	The course helps students to prepare for the real world in which there is a diversity of operating system & platform.					
CO 1	To familiarize with basic commands of Linux.					
CO 2	To study Linux networking and file system.					
CO 3	To understand the installation of server.					
CO 4	Security in Linux.					

Unit-1

Introduction: Basic concepts of the operating system. Commands, shells and processes; users and groups; file system and directories. System installation, configuration and upgrade Installation stages; network installation; disk partitioning; post-install system customization and upgrade; dpkg and APT package installation, remove, upgrade and query; semiautomatic system installation.
Kernel: Kernel tasks; managing kernel modules at runtime; kernel configuration and compilation boot loaders GRUB and LILO.

Unit-2

Linux Networking: Basic concepts of networking: Network packets, TCP/IP protocol suit, address resolution protocol (ARP); IP addresses and network mask; subnets and routing; IPV4 and Network classes; ports. Configuring Linux machine on the network; arp, ipconfig and netstat commands. Network services and tools; telnet, rsh, ftp, rcp, ssh, rsync, inetd.conf; opening and closing ports.
Network File system (NFS): File system sharing or the network; remote procedure call (R P C) services; NFS server and client sides; NFS installation & configuration; and statistic mount and auto mount configuration; when trouble shooting NFS; security and optimization
Network information service (NIS): Centralized authentication systems; sharing user and host information or the network; IS server and client sides and configuration; compatibility mode; net group; security issues.

Unit –3

Integrating Linux and Windows: Elements of windows networking; Net BIOS SMB\ \ CIFS protocols; domain controller; Samba server on Linux for centralized window logon; file sharing and printing, samba client; samba installation and configuration; Unix and windows password. Dual Boot: running windows and Linux on the same PC; GRUB and NT Boot loaders; accessing windows files systems from Linux and vice versa;
Light Weight Directory Access Protocol (LDAP): Overview of Unix authentication and naming service; introduction to LDAP: Domain component (DC); organizational Unit (OU); common names (CN); Schemas; IDIF format; services; polls and commands; server and client sides; Open LDAP installation and configuration; LDAP applications. Shell scripting, syntax of brash; looping; case statement; function; command substitution; awk, grep, sed. Startup and Run Levels. Scheduled jobs. Boot up and login process sequence; run levels; startup scripts; scheduling jobs with at and cron.

Unit-4

Linux Security: System vulnerabilities; port scanning; encryption, encrypted services and connections; PGP/GPG Intrusion protection: tcp-wrappers, IP-firewalls (iptables), NAT and DMZ; Intrusion detection systems: tripwire; Secure system management practices.
Email Server: Steps of Email transaction; Email envelope and headers; SMTP servers; IMAP and POP3 servers; E-mail relay; Postfix configuration; Spam and viruses,
Domain Name Server (DNS): Host name resolution; domain name hierarchy; DNS zones; configuration of master, slave and caching DNS servers with BIND 9.

Text Books

1. Bell & Duff , *Red Hat Linux 9* –- Pearson.
2. Richard L. Peterson , *Complete Reference, Red Hat Linux*—TMH.
3. Tery Dawson, Gregor N. Purdy, Tony Bautts ; *Linux N/W Administration Guide*– OREILLY.

Reference Books

1. Christopher Negus *, Red Hat Linux 9 Bible*- WILEY publishing.
2. Patrick Volker Ding, Kevin Richard, Eric Foster-Johnson, *Linux Configuration & Installation* BPB publication.
3. John Goerzen, *Linux Programming Bible* -Wiley Dream Tech India (P) Ltd.

NOTE: Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT - 303 N	Introduction to Digital & Data Communication					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**--**	**--**	**75**	**25**	**100**	**3(Hrs.)**
Purpose	To provide the knowledge of digital data communication					
CO 1	To introduce the concept of communication.					
CO 2	To study pulse modulation.					
CO 3	To educate about the various modulation techniques in digital communication					
CO 4	To understand various methods for data transmission.					

Unit-1

Introduction

What is communication , Elements of communication system , Signal , Concept of bandwidth , sources of signal , Types of communication channels , classification of electronic communication system , Modulation , Introduction to analog modulation system – AM , FM , PM ; Elements of Digital communication system , Comparison of analog and digital modulation , advantages and disadvantages of digital communication , Limitations of communication system , Electromagnetic spectrum for communication

Unit-2

Pulse Modulation:

Sampling theorem, Nyquist rate, Introduction to PAM, PWM, PPM; Quantization, Introduction to PCM and delta modulation, Introduction to TDM and FDM

Unit-3

Digital Modulation

Line coding, introduction to Encoding schemes: RZ , NRZ ; Modulation Techniques – ASK-FSK-PSK-QPSK

Unit-4

Digital data Transmission

Classification: Parallel, Serial, Asynchronous and synchronous transmission; Error Detection and correction techniques: Parity checks, Hamming code; DTE & DCE interface,
Introduction to: a) RS-232C, b) RS-449, c) USB , d) HDMI.

Text Books:

1. Proakis, *"Digital Communications",* Mc Graw Hill.
2. Sanjay Sharma , *" Digital communication"* , S.K. Kataria and sons

Reference Books :

1. W.Stalling, *"Wireless Communication And Networks"* , Pearson.
2. Stallings, *"Data & computer Communications",* PHI.
3. Forouzen, *"Data Communication & Networking",* Tata Mcgraw Hill.
4. Miller, *"Introduction to Digital & Data Communications"*, Jaico Pub.

NOTE: The course is introductory in nature. Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT-305 N	JAVA Programming					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3(Hrs.)**
Purpose	To understand design and implementation of various software applications.					
CO 1	To study basic concept of OOP.					
CO 2	Learn about the interfaces, multithreading in JAVA.					
CO 3	To study database connectivity with JAVA.					
CO 4	To familiarize the student to server side programming.					

Unit-1

Introduction to Java & Principles of Object Oriented Programming: Basic Concepts of OOP and it's Benefits. Application of OOP. The Creation of Java, Importance of Java for the Internet, Java's Magic: The Byte-code, Features of Java. Object-Oriented Programming in Java, Java Program Structure.

Defining Classes: Defining of a Class, Definition of Methods, Constructors, Creating Objects of a Class, Assigning Object Reference Variables, The keyword "this" , Defining and Using a Class, Automatic Garbage Collection.

Arrays and Strings: Arrays, Arrays of Characters, String handling Using String Class, Operations on String Handling Using. String Buffer Class.

Extending Class and Inheritance: Using Existing Classes, Class Inheritance, Choosing Base Class, Access Attributes, Polymorphism, Multiple Levels of Inheritance, Abstraction through Abstract Classes, Using Final Modifier, The Universal Super class-Object Class.

Unit-2

Package & Interfaces: Understanding Packages, Defining a Package, Packaging up your Classes, Adding Classes from a Package to your Program, Understanding CLASSPATH, Standard Packages, Access Protection in Packages, Concept of Interface.

Exception Handling: The Idea behind Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Defining Your Own Exceptions, Checked and Unchecked Exceptions.

Multithreading Programming: The Java Thread Model, Understanding Threads, The Main Thread, Creating a Thread: extending Thread and implementing Runnable, Creating Multiple Threads, Thread Priorities, Synchronization, Deadlocks inter-thread communication, Deadlocks.

Input/Output in Java: I/O Basic, Byte and Character Structure, I/O Classes, Reading Console Input, Writing to Console Output, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File. Stream Benefits.

Unit-3

Creating Applets in Java: Applet Basics, Applets Architecture, Applet Life Cycle, Simple Applet Display Methods, Requesting Repainting, Using the Status Window, The HTML APPLET Tag, Passing parameters to Applets.

Java Data Base Connectivity (JDBC): Database Connectivity- Relation Databases, JDBC API, Reusing Database Objects, Transactions, Advance Techniques.

Working with Windows: AWT Classes, Window Fundamentals, Working with Frame, Creating a Frame Window in an Applet, displaying information within a Window.

Unit-4

Event Handling: Two Event Handling Mechanisms, The Delegation Event Model, The Event Handling Process, Event Classes, Sources of Events, event Listener Interfaces, Using the Delegation Event Model, Adapter Classes.

Java Servlet Programming: Role and Advantages of Java Servlets in Web application Development.

HTTP Servlets- Introduction, page generation, server side includes, servlet chaining, java Server pages.

Server Life Cycle: Servlet Alternative, Reloading, Init and Destroy, Single Thread Model, Background Processing Last Modified times, synchronization, Persistent state capabilities.

Text Books / Reference:

1. Herbertz Schildt , *The complete Reference Java,* Mc Graw.
2. Ivor Horton , *Beginning JAVA 2 (JDK1.3 Edition),* , WROX Public.
3. Bruce Eckel , *Thinking in Java,* Prentice Hall.
4. Jamie Jaworski, "*Java Unleashed",* SAMS Techmedia Publication, 1999.
5. JAVA 2 (1.3) API Documentations.
6. E. Balaguruswamy *, "Programming with Java"* , Tata McGraw-Hill Education.

NOTE: Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT-307 N	Multimedia & Virtual Reality					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**-**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To familiarize with different techniques and tools of multimedia applications.					
CO 1	Introduction to basics of multimedia technologies.					
CO 2	To study file system and information model of multimedia.					
CO 3	To familiarize with the animation in multimedia.					
CO 4	To study the virtual reality concepts.					

UNIT - 1

Basics of Multimedia Technology: Computers, communication and entertainment, multimedia an introduction & emerging applications, framework for multimedia systems, multimedia devices, CD-AUDIO,CD_ROM, multimedia presentation tools.
Audio, Video And Image: Digital representation of sound, transmission of digital sound, MPEG-Audio ,audio compression and decompression, brief survey of speech recognition and generation, musical instrument digital interface, evaluating a compression system-redundancy and visibility , video compression techniques, JPEG-image compression standards, MPEG-motion video compression standard-DVI Technology

UNIT - 2

Multimedia File Systems and Information Models: The case of multimedia information system, file support for continuous media-data models for multimedia and hyper media information, multimedia presentation and authoring, current state of industry-design paradigms and user interface-barriers to widespread use, multimedia system service architecture, media stream protocol and services and window system, client control of continuous media, file system support, hyper applications.

UNIT - 3

Multimedia Communication Systems: Multimedia services over the public network, requirements, architecture and protocols-applications-network services-network protocols-multimedia interchange :Quicktime movie file format(QMF)-MHEG(Multimedia and Hypermedia information and coding expert group)-format function and representation summary-real time interchange-Multimedia conferencing: teleconferencing systems.
Animation: Introduction, Basic terminology techniques, Motion graphics 2D & 3D animation. Introduction to MAYA (Animating tool): Fundamentals, Modeling: NURBS, Polygon, Organic, animation, paths & boxes, deformers, working with MEL: Basics & programming Rendering &special effects: shading & texturing surfaces lighting, special effects.

UNIT - 4

Virtual Reality: Introduction to Virtual Reality, Four key elements of virtual reality - a) virtual world, b) immersion, c) sensory feedback d) interactivity, ; Desktop virtual reality, VR operating system, virtual environment displays & orientation making; visually coupled system requirements; intelligent VR software systems.

Text Books:

1. David Hillman ,*"Multimedia Technology & Applications",* Galgotia publications.
2. John.F.Koegel Buford, *Multimedia Systems*, Pearson education,1994.
3. John Villamil Louis Molina , *Multimedia An Introduction* PHI.
4. Jose Lozano , *Multimedia: Sound & video*, PHI(Que)
5. Sherman & Craig*. Understanding Virtual Reality – Interface, Application, and Design*, Morgan Kaufmann, 2002.

Reference Books:

1. John Villamil *Multimedia : Production, planning and delivery ,* Que E&T, 1997.
2. Jeff Coate Judith , "*Multimedia in Action"*, 1995, PHI.
3. Norman Desmarais, *Multimedia on the PC: A Guide for Information Professionals,* Mc Graw Hill.
4. Ze-Nian Li and Mark S.Drew, *Fundamentals of Multimedia ,* Pearson education.

NOTE: Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT-309 N	Computer Graphics					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	To provide the conceptual knowledge of Computer Graphics.					
CO 1	Introduction to different graphics algorithm.					
CO 2	To acquaint with viewing system and clipping.					
CO 3	To study different transformation techniques and projection of an object.					
CO 4	To familiarize with 3D curves and surfaces.					

Unit – 1

Introduction: What is Computer Graphics, Computer Graphics Applications, Two dimensional Graphics Primitives: Points and Lines, Point Plotting Techniques: Coordinate system, Incremental Method, Line drawing algorithms: DDA & Bresenhams's; Circle generating algorithms: Using polar coordinates, Mid point circle drawing algorithms . Filled area algorithms: Scan line polygon filling algorithms, Boundary filled algorithms.
Graphic devices: Light pen, Mouse, Tablet, Touch panel, Digitizers

Unit – 2

Two Dimensional Viewing: Two dimensional geometric transformations, Viewing pipeline, Window to view port transformation, Window to view port mapping.
Clipping: Point & Line clipping algorithm, Cohen-Sutherland Line clipping algorithms, Polygon clipping: Sutherland-Hodgeman Polygon clipping algorithm. Curve clipping, Text clipping.

Unit – 3

Three Dimensional Viewing: Introduction to Three-dimensional display methods : Parallel & Perspective Projection , depth cueing , surface rendering ; Three-Dimensional Geometric and Modeling Transformations; Viewing pipeline, Viewing coordinates,.

Unit – 4

Representation of 3-D Curves and Surfaces: Curved lines and surfaces, spline representations, interpolation and approximation splines, Parametric continuity conditions, Geometric continuity conditions.
Bezier curves and surfaces: Bezier curves, properties of Bezier curves, Bezier surfaces, B-spline curves and surfaces.
Hidden Surfaces removal: Classification of Visible-Surface Detection algorithms , Hidden surface elimination, depth buffer algorithm, scan line coherence and area coherence algorithm, priority algorithm.
Introduction to animation: Design of Animation Sequences, General Computer-Animation Functions, Morphing

Text Books

1. Hern & Baker – *Computer Graphics*, 2nd Ed. PHI.
2. Newmann & Sprawl – *Introduction to interactive Computer Graphics*, MGH.

Reference Books

1. Harrington – *Computer Graphics* – A programming Approach.
2. Rogers – *Principles of Computer Graphics* – MGH.
3. Folay – *Fundamental of Interactive Computer Graphics* – Addison Welsey

NOTE: The course is introductory in nature. Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT-311 N	Computer Graphics Lab					
Lecture	**Tutorial**	**Practical**	**Minor Test**	**Practical Exam**	**Total**	**Time**
--	**--**	**3**	**40**	**60**	**100**	**3(Hrs.)**
Purpose	To provide the conceptual knowledge of Computer Graphics.					
CO 1	To implement different graphics algorithm.					
CO 2	To perform practical on viewing system and clipping.					
CO 3	To study different transformation techniques and projection of an object.					
CO 4	To implement Beizer curve					

List of experiments:

1. Write a program to implement DDA line drawing algorithm.
2. Write a program to implement Bresenham's line drawing algorithm.
3. Implement the Bresenham's circle drawing algorithm.
4. Write a program to implement the midpoint circle drawing algorithm.
5. Write a program to implement 2-D transformations.
6. Write a program to show a ball moving on the screen according to the given requirements.
7. Write a program to implement the midpoint circle drawing algorithm.
8. Write a program to implement the Beizer curve.
9. Implement the line clipping algorithm using C.
10. Implement boundary fill algorithm using C.
11. Implement the depth buffer algorithm using C.

Note: A student has to perform 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.

IT-313 N	Multimedia Lab					
Lecture	**Tutorial**	**Practical**	**Minor Test**	**Practical Exam**	**Total**	**Time**
--	--	2	40	60	100	3(Hrs.)
Purpose	To familiarize different techniques and tools of multimedia applications.					
CO 1	Introduction to basics of multimedia technologies.					
CO 2	Creation of websites					
CO 3	To study animation in multimedia.					
CO 4	To use adobe photoshop for editing.					

List of experiments:

1. Create any two slides using power point
2. Create a website on any of your favorite topic.
3. Create a website of your college using HTML tags
4. Perform the following using Movie star:
    a) Video Capturing
    b) Video Editing and
    c) Creating Video CD.
5. Animate a ball using Flash
6. Using Adobe Deluxe Photoshop edit a digital photo by changing the background color, changing the theme, changing the part of the photo and editing the different parts of the photo.
7. Animate the following using GIF animator**:**
    a) Image
    b) Banner Text
8. Perform the following using Multimedia Software**:**
    a) Clip a portion of an audio wave file
    b) Add another audio file to the above clipped file
9. Perform the following using Multimedia software
    a) Extract audio from video file like .avi/.dat/.mpeg and save it in MP3
    b) Change the format of above audio file into midi/wav/asf/wm/cda

Note: A student has to perform 9 experiments. At least seven experiments should be performed from the above list. Two experiments may be designed & set by the concerned institution as per the scope of the syllabus.

IT-315 N	JAVA Programming Lab					
Lecture	**Tutorial**	**Practical**	**Minor Test**	**Practical Exam**	**Total**	**Time**
--	**--**	**3**	**40**	**60**	**100**	**3(Hrs.)**
Purpose	To introduce the principles and paradigms of Java Programming.					
CO 1	Introduction to the concept of OOP.					
CO 2	To implement various programs in JAVA					
CO 3	To study database connectivity with JAVA.					
CO 4	To study server side programming					

List of experiments:

1. Write a program to illustrate the concept of simple and multilevel inheritance.
2. Write a program to illustrate the concept of "this" keyword.
3. Write a program to illustrate the concept of Constructor and method Overloading.
4. Write a program to draw a Pyramid in JAVA.
5. Write a program to implement Binary Search.
6. Write a program to illustrate the concept of Threads by using yield (), stop (), and sleep () methods.
7. Write a program to illustrate the concept of synchronization in Threads.
8. Write a program to illustrate the concept of applets.
9. Write a program to draw shapes using Graphics Methods
10. Write a program to read a record into database using JDBC Connectivity.
11. Write a program to illustrate the concept of Event Handling

Note: A student has to perform 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.

IT-317 N	Linux Lab					
Lecture	**Tutorial**	**Practical**	**Minor Test**	**Practical Exam**	**Total**	**Time**
--	--	2	40	60	100	3(Hrs.)
Purpose	To introduce the student to Linux OS					
CO 1	To explore basic commands of Linux.					
CO 2	To study Linux networking and file system.					
CO 3	To learn installation of server.					
CO 4	To familiarize with administration of Linux operating system					

LIST OF EXPERIMENTS

1. Install Linux on the system dual boot with the windows Operating System.
2. Do the following tasks :-
   a) Create, remove & resize various types of partitions through GUI as well as command line.
   b) Configure printers in Linux through GUI as well as command line.
3. Creating, Removing of Swap space as well as swap files trough command line as well as GUI.
4. Implementation Disk Quotas- enabling, creating, mounting, configuring, assigning, disabling.
5. Managing Users and Groups in Linux- Adding, Modifying, Password aging.
6. Configuration Networks on Linux through GUI & Command Line- Ethernet, Modem, ISDN, Wireless.
7. Configuring NFS (Network File System) on Linux both GUI & Command Line.
8. Configuring Samba server on Linux both GUI & Command line.
9. Configuring D.N.S (Domain Name system) server on Linux both GUI & Command Line.
10. Configure an e-mail server in Linux-send mail.
11. Configuring Firewalls and managing various services of Linux.
12. Configuring Log Server in Linux.

Note: A student has to perform 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.

IT-302 N	Analysis & Design of Algorithms					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3(Hrs.)**
Purpose	To explore fundamentals of algorithm design.					
CO 1	To study the behavior of an algorithm.					
CO 2	To familiarize with dynamic programming.					
CO 3	To focus on back tracking and branch and bound problems.					
CO 4	To learn the computational graph searching and tree traversals.					

Unit – 1

Introduction: Algorithm, Analyzing algorithm, Designing algorithm, Concept of algorithmic efficiency, Run time analysis of algorithms, Asymptotic Notations.
Divide and conquer: Structure of divide and conquer algorithms: examples; binary search, quick sort, Strassen Multiplication; Analysis of divide and conquer run time recurrence relations.

Unit – 2

Greedy Method: Overview of the greedy paradigm examples of exact optimization solution (minimum cost spanning tree), approximate solution (Knapsack problem), Singles source shortest paths.
Dynamic programming: Overview, difference between dynamic programming and divide and conquer, Applications: Shortest path in graph, Matrix multiplication, Travelling salesman problem, longest common sequence.

Unit – 3

Back tracking: Overview, 8-queen problem, and Knapsack problem
Branch and bound: LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem.

Unit – 4

Graph searching and Traversal: Overview, Traversal methods (depth first and breadth first search).
Trees: Review of trees, Binary search tree, Traversal, Insertion & Deletion in Binary Search Tree, B-Trees, B+Trees, Basic operations on B Trees.
Computational Complexity: Complexity measures, Polynomial Vs non-polynomial time complexity; NP-hard and NP-complete classes, examples.

Text Book:
1. E. Horowitz, S. Sahni, and S. Rajsekran, *" Fundamental of Computer Algorithms,"* Galgotia Publication

Reference Books:
1. T. H. Cormen, Leiserson, Revest and Stein, *"Introduction of Somputer algorithm,"* PHI.
2. Sara Basse, A. V. Gelder, " *Computer Algorithms,"* Addison Wesley.

NOTE: Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT-304 N	Software Engineering					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	--	--	75	25	100	3(Hrs.)
Purpose	To familiarize the students with the concept of designing the software.					
CO 1	To study different software life cycle model.					
CO 2	To acquaint with requirement analysis and designing phase of software development.					
CO 3	To learn different testing and maintenance in software engineering					
CO 4	To explore quality assurance and reliability of the software.					

Unit – 1

Introduction: Program vs. software products, emergence of software engineering, software life cycle, models: waterfall, prototype, evolutionary and spiral model, Software Characteristics, Applications, Software crisis.

Software project management: Project management concepts, software process and project metrics Project planning, project size estimation metrics, project estimation techniques, empirical estimation techniques, COCOMO, A Heuristic estimation techniques, staffing level estimation, team structures, staffing, risk analysis and management, project scheduling and tracking.

Unit – 2

Requirements Analysis and specification: Requirements engineering, system modeling and simulation Analysis principles modeling, partitioning Software, prototyping, Prototyping methods and tools, Specification principles, Representation, the software requirements specification and reviews Analysis Modeling: Data Modeling, Functional modeling and information flow: Data flow diagrams, Behavioral Modeling, The mechanics of structured analysis: Creating entity/relationship diagram, data flow model, control flow model, the control and process specification, The data dictionary, Other classical analysis methods.

System Design: Design concepts and principles: the design process: Design and software quality, design principles, Design concepts: Abstraction, refinement, modularity, software architecture, control hierarchy, structural partitioning, data structure software procedure, information hiding, Effective modular design: Functional independence, Cohesion, Coupling, Design Heuristics for effective modularity; The design model; Design documentation. Architectural Design: Software architecture, Data Design: Data modeling, data structures, databases and the data warehouse, Analyzing alternative Architectural Designs, architectural complexity; Mapping requirements in to software architecture; Transform flow, Transaction flow; Transform mapping; Refining the architectural design.

Unit – 3

Testing and maintenance: Software Testing Techniques, software testing fundamentals: objectives, principles, testability; Test case design, Unit testing: white box testing, basic path testing: Control structure testing: Black box testing, testing for specialized environments, architectures and applications. Software Testing Strategies: Verification and validation, Integration testing, Validation testing, alpha and beta testing. System testing: Recovery testing, security testing, stress testing performance testing; The art of debugging process debugging approaches. Software re-engineering: Reverse engineering, restructuring, forward engineering.

Unit – 4

Software Reliability and Quality Assurance: Quality concepts, Software quality assurance, SQA activities; Software reviews: cost impact of software defects, defect amplification and removal; formal technical reviews: The review meeting, review reporting and record keeping, review guidelines; Formal approaches to SQA; Statistical software quality assurance; software reliability: Measures of reliability and availability, The ISO 9000 Quality standards, SEI-CMM Capability Maturity Model.

Computer Aided Software Engineering: CASE, building blocks, integrated case environments and architecture, repository.

Text Books:

1. Roger S. Pressman, *Software Engineering – A Practitioner's Approach,* , 1966, MGH.
2. Rajib Mall , *Fundaments of software Engineering,* , PHI

Reference Books:

1. Pankaj Jalote, *An Integrated Approach to Software Engineering* 1991 Narosa.
2. Ian Sommerville , *Software Engineering* , Pearson Edu, 5th edition, 1999, AW.
3. Ali Behforooz and Frederick J. Hudson. *Software Engineering Fundamentals*, Oxford University,

NOTE: Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT-306 N	Computer Networks					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**--**	**-**	**75**	**25**	**100**	**3(Hrs.)**
Purpose	This course covers the concepts of computer networking and communication.					
CO 1	Introduction to fundamental of networking model.					
CO 2	To study different protocols used for transmitting data.					
CO 3	To explore physical and data link layer of networking model.					
CO 4	To study Network and transport layer of networking model.					

Unit – 1

Introduction: Basics of Computer Networks, need and Evolution of computer networks, description of LAN, MAN, WAN & wireless networks.

Basics terminology of Computer Networks: Bandwidth, physical and logical topologies, media 10 base A, 10base 5, 10 base 5, 10base-T, 100 base FX, 100base LX and wireless.

LAN & WAN devices – Router, Bridge Ethernet switch HUB, Modem SCU/DSU.

OSI Reference Model:

Laying architecture of networks, OSI model, Functions of each layer, Services and Protocols of each Layer.

Unit – 2

TCP/IP: Introduction History of TCP/IP, Layers of TCP/IP, Protocols, Internet Protocol, Transmission control protocol, User Datagram Protocol, IP Addressing, IP address classes, Subnet addressing, Internet control Protocols, ARP, RARP, ICMP, application layer, Domain Name System, Email-SMTP, POP, IMAP, FTP, NNTP, HTTP, SNMP,TELNET, overview of IP version 6.

OSI and TCP/IP model with description of data encapsulation & peer to peer communication, comparison of OSI and wireless.

Unit – 3

Physical Layer: Representation of a bit on physical modem that is in wired network, optical network and wireless network. Encoding/Modulation – TTL, Manchester Encoding, AM, FM and PM. Dispersion, Jitter, Latency and Collision. Different types of media-twisted pair, unshielded twisted pair, coaxial cable, optical Fiber cable and wireless.

Data Link Layer: LLC and MAC sub layer, MAC addressing layer 2 devices, framing error control and flow control. Error detection & correction CRC, block codes parity and checksum, elementary data link protocol, sliding window protocol, channel allocation problem-static and dynamic, Multiple Access protocol- ALOHA, CSMA/CU, Token bus, token ring, FDDI.

Unit – 4

Network Layer: Segmentations and autonomous system path determination, network layer addressing, network layer data gram, IP addressed Classes. Sub netting – Sun network, Subnet Mask, Routing algorithm-optionally principle, Shortest path routing, hierarchical routing, Broadcast routing, Multicast routing, routing for mobile host – tunneling, fragmentation and DHCP, Routing protocol- RIP, IGRP, USPF and EIGRP.

Transport Layer: TCP & UDP. Three way handshaking . ATM AAL layer protocol.

Text Book:

1. Tanenbaum. *"Computer Networks",* PHI

Reference Books:

1. Darlx, " *Computer Network and their protocols",* DLA Labs.
2. Freer, "*Comp. Communication and Networks*", East – West-Press.
3. Halsall Fred, *Data Communications, Computer Networks & open systems* Addison Wesley
4. Fitzgerald Jerry, *Business data communications*,
5. Larry L. Peterson & Bruce S. Davie *Computer Networks – A system approach*, , 2nd Ed TMH.

NOTE: Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT – 308 N	Introduction to Microcontroller					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**--**	**--**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	**To learn programming of 8051 microcontroller and its interfacing**					
CO 1	To study the Architecture of 8051 microcontroller					
CO 2	Familiarization with the instruction / commands of microcontroller					
CO 3	To study timing delays					
CO 4	To learn how various devices can be interfaced with microcontroller					

UNIT-1

Introduction: - Evaluation of Microcontrollers; Classification of Microcontroller; Comparison between Microprocessor and Microcontrollers; Overview of 8051 microcontroller family. Block Diagram, Architecture and pin description of 8051. ; Types of Registers and flags of 8051.

UNIT-2

Introduction to programming of Microcontroller: - 8051 Instruction Format, Addressing modes, Data transfer instructions; Logical operations, Arithmetic operations, looping, jump and call instructions, Programming in C.

UNIT-3

Timer Programming and interrupts :- 8051 timer Programming ; 8051 Serial port programming; 8051 interrupt programming; External memory interfacing.

UNIT-4

Interfacing of microcontroller :- LCD , Keyboard interfacing ; A/D , D/A and sensor interfacing; Microcontroller interfacing with a) Relays b) opto-isolators , c) stepper motor d) DC motor

Text Books

1. Muhammad Ali Mazidi., "*The 8051 Microcontroller And Embedded Systems Using Assembly And C"* , Pearson , 2nd edition
2. Kenneth J. Ayala , *"The 8051 Microcontroller" .*

Reference Books

1. Mackenzie , *"The 8051 Microcontroller" ,* Pearson Education.
2. Ghoshal Subrata *, "8051 Microcontroller: Internals, Programming & Interfacing",* Pearson Education..

Note: The course is introductory in nature. Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT-310 N	Data Warehouse & Data Mining					
Lecture	**Tutorial**	**Practical**	**Major Test**	**Minor Test**	**Total**	**Time**
4	**1**	**-**	**75**	**25**	**100**	**3 (Hrs.)**
Purpose	This course provides a way to understand the organization and collection of data.					
CO 1	To study basic concept of data warehouse.					
CO 2	To study the techniques of data warehouse.					
CO 3	To understand the basic concept of data mining.					
CO 4	To study data mining rules.					

UNIT-1

Introduction of Data Warehousing: The evolution of Data Warehousing (The Historical Context). The data warehousing –a brief history, today's development environment. Principles of Data Warehousing (Architecture and Design Techniques): Types of data and their uses, conceptual data architecture, design techniques, introduction to the logical architecture. Creating the Data Asset: Business Data Warehouse Design.

UNIT-2

Unlocking the Data Asset for end users (The use of Business Information) : Designing business information warehouse, populating business information warehouse, user access to information, information data in context. Implementing the Warehouse (Managing the project and environment) : Obstacles to implementation, planning your implementation, justifying the warehouse, organizational implications of data Warehousing, the data warehouse in your organization, data warehouse management, looking to the future.

UNIT-3

Introduction of Data Mining: Motivation, importance, data mining, kind of data, functionalities, interesting patterns, classification of data mining system, major issues. Data warehouse and OLAP technology for data mining : data warehouse, operational database systems and data warehouse architecture, implementation, development of data cube technology, data warehousing to data mining, data warehouse usage.

UNIT-4

Data Preparation: Preprocess data cleaning, data integration and transformation, data reduction, discrimination and concept hierarchy generation. Data Mining Primitives, languages and system architectures, graphical user interfaces. Concept Description: Characterization and comparison data generalization and summarization based characterization, analytical characterization, and analysis of attribute relevance, mining class comparison, and mining descriptive statistical measures in large databases. Mining association rules in large databases, mining single dimensional Boolean association rules from transactional databases, mining multi-dimensional association rules from relational databases and data warehouses, from association to correlation analysis, constraint based association.

Text Books

1. J. Han & M. Kamber, *Data Mining*: *Concepts and Techniques*, Morgan Kaufmann/Elsevier, India, 2001
2. D. Hand, H. Mannila, & P. Smyth. *Principles of Data Mining*, MIT Press, 2001.

Reference books

1. M. Jarke et al. *Fundamentals of Data Warehouses (2nd ed.)*, Springer, 2003, ISBN 3-540-42089-4.
2. C. Seidman, *Data Mining with Microsoft SQL Server 2000* Technical Reference Microsoft Press, ISBN 0-7356-1271-4

NOTE: Eight questions each of 15 marks are to be set in all by the examiner taking two questions from each unit. Students will be required to attempt five questions in all, selecting at least one question from each unit.

IT-312 N	Software Engineering Lab					
Lecture	**Tutorial**	**Practical**	**Minor Test**	**Practical Exam**	**Total**	**Time**
--	**--**	**2**	**40**	**60**	**100**	**3 (Hrs.)**
Purpose	To familiarize the students with the concept of designing the software applications.					
CO 1	To study different software life cycle model.					
CO 2	To study Requirement and designing phase of software development.					
CO 3	To study testing and maintenance phase of software development.					
CO 4	To study quality assurance and reliability of software.					

LIST OF EXPERIMENTS

1. Study and categorize the generic phases of software development and maintenance.
2. Study various software development models.
3. Study various types of feasibility study and steps in doing feasibility study.
4. Study various steps for doing the requirement analysis of any project.
5. Write algorithm and draw flow chart to implement the constructive cost estimation model (COCOMO).
6. Making use of Graphical Design notation, study the concept in developing data flow diagram (DFD) for any selected project.
7. Making use of object oriented design, implement a student & employee record system using the concept of inheritance.
8. Select an appropriate programming language & translate the detailed design made in experiment 7 in appropriate programming language.
9. Develop a complete test strategy for the project selected in exp-8. Document it in a test specification.
10. Apply the debugging process to the project selected in exp-9 in accordance with the result generated from its testing in exp-9.
11. Study various concepts involved in cost / benefit analysis.
12. Draw flow chart and write algorithm for designing an editor.

Note: A student has to perform 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.

IT-314 N	Networking Lab					
Lecture	**Tutorial**	**Practical**	**Minor Test**	**Practical Exam**	**Total**	**Time**
--	**--**	**2**	**40**	**60**	**100**	**3 (Hrs.)**
Purpose	This course covers the concepts of computer networking and communication.					
CO 1	To learn the basic concept and networking model.					
CO 2	To study different protocols used for transmitting data.					
CO 3	To study physical and data link layer of networking model.					
CO 4	To study Network and transport layer of networking model.					

LIST OF EXPERIMENTS

1. Study the physical media of connectivity.
2. Study the pin-structure of cross-over cable.
3. Study the different LAN Technologies.
4. Study the functioning of a Switch.
5. Study the Functioning of a Router.
6. Establishing LAN (Star topology) for your LAB using Hubs (18 ports, 16 ports).
7. Study and install the media converting using optical fiber.
8. Install and configure the LAN card.
9. Install and configure window 200 Server.
10. Study and implement the virtual network.

Note: A student has to perform 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.

IT-316 N	Visual Basic.net Lab					
Lecture	**Tutorial**	**Practical**	**Minor Test**	**Practical Exam**	**Total**	**Time**
--	**--**	**3**	**40**	**60**	**100**	**3 (Hrs.)**
Purpose	This course covers the concepts of .net programming.					
CO 1	To learn the basic concept of GUI					
CO 2	To study SMTP					
CO 3	To study encryption and decryption					
CO 4	To study how to create drawing application in VB.Net					

LIST OF EXPERIMENTS

1. Create a calculator that can be used for adding, subtracting, multiplication and division.
2. Write an application to use WMI to retrieve information about your PC.
3. Write an application to create a File and Folder browser.
4. Write a program in VB.NET to send an email via SMTP.
5. Write a program to create a MDI web browser.
6. Write an application to access registry in VB.NET.
7. Write a program to retrieve a web page source from the Internet.
8. Create a slot machine game using standard controls and random number generator.
9. Write a program to create a word processor.
10. Write a program for encryption and decryption.
11. Write an application to capture screen.
12. Create a drawing application in VB.NET.
13. Write an application in VB.NET to play MP#3 files.

Note: A student has to perform 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.

IT-318 N	Microcontroller Lab					
Lecture	**Tutorial**	**Practical**	**Minor Test**	**Practical Exam**	**Total**	**Time**
--	**--**	**2**	**40**	**60**	**100**	**3 (Hrs.)**
Purpose	To train the student on how to use Microcontroller.					
CO 1	To introduce the student to Microcontroller programming					
CO 2	To control LCD module.					
CO 3	Use of microcontroller in controlling stepper motor					
CO 4	Practical approach in interfacing of microcontrollers with different devices.					

LIST OF EXPERIMENTS

1. Introduction to microcontroller trainer and interfacing modules.
2. To display the digital output of ADC on 16*2 LCD Module.
3. To display character 'A' on 8*8 LED Matrix.
4. To display the data and time on LCD Module
5. To interface the seven segment display with microcontroller 8051.
6. To create a series of moving lights using 8051 on LEDs.
7. To interface the stepper motor with microcontroller.
8. To switch on and off relay by using keys.
9. To interface the DC motor using H-Bridge.
10. To interface a keypad with microcontroller.

Note: A student has to perform 10 experiments. At least seven experiments should be performed from the above list. Three experiments may be designed & set by the concerned institution as per the scope of the syllabus.

IT-320 N	Colloquium & Professional Proficiency					
Lecture	**Tutorial**	**Practical**	**Minor Test**	**Practical Exam**	**Total**	**Time**
-	**--**	**2**	**100**	**-**	**100**	
Purpose	To enhance holistic view of students so as to improve their employability skills.					
CO 1	To develop inter personal skills and be an effective goal oriented team player.					
CO 2	To develop communication and problem solving skills.					
CO 3	To develop aptitude					
CO 4	To enhance general knowledge of students in various domains of life.					

A practical and activity oriented course with continuous assessment for 100 marks.

The course will comprise of:

a) Class room interaction and activities: Technical Quiz, aptitude tests, extempore speech, general knowledge test etc.
b) Seminars
c) Presentation

The student will submit a course report comprising of credits / results based on the above.