CIVIL ENGINEERING

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. FOURTH YEAR

CIVIL ENGINEERING

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session: 2021-22]

CIVIL ENGINEERING

SEVENTH SEMESTER CIVIL ENGINEERING SESSION 2021-22

S.No	Subject Code	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KHU701/ KHU702	HSMC-1*/HSMC-2*	3	0	0	30	20	50		100		150	3
2		Departmental Elective -IV	3	0	0	30	20	50		100		150	3
	KCE 070	Railway, Waterway and Airway Engineering											
	KCE 071	Sustainable Construction Methods											
	KCE 072	Probability Methods in Civil Engineering											
	KCE 073	Advance Concrete Design											
	KCE 074	Solid Waste Management											
3		Departmental Elective -V	3	0	0	30	20	50		100		150	3
	KCE 075	Design of Steel Structures											
	KCE 076	Urban Transportation Planning											
	KCE 077	Geosynthetics and Reinforced Soil Structures											
	KCE 078	Irrigation and Water Resource Engineering											
	KCE 079	Disaster Preparedness and Management											
4		Open Elective-II	3	0	0	30	20	50		100		150	3
5	KCE751	Concrete Lab	0	0	2				25		25	50	1
6	KCE752	Mini Project or Internship Assessment*	0	0	2				50			50	1
7	KCE753	Project	0	0	8				150			150	4
8		MOOCs (Essential for Hons. Degree)											
		Total	12	0	12							850	18

NOTE:

1. **Regular classroom interaction with industry experts is to be ensured in all theory courses (minimum two expert talks from relevant Industry).**
2. **Working on experiments using virtual labs is to be ensured in lab courses.**
3. **Student's visit to Industry/Industry Expert's project site must be arranged as & when possible.**
4. **The Mini Project or Internship (4 - 6 weeks) conducted during semester break after VI semester will be assessed during VII semester.**
5. **Project work is to be identified during VI semester, Initiated in VII semester (KCE 753) and completed in VIII semester (KCE 851).**

EIGHTH SEMESTER CIVIL ENGINEERING SESSION 2021-22

CIVIL ENGINEERING

S.No	Subject Code	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KHU801/ KHU802	HSMC-1* / HSMC-2*	3	0	0	30	20	50		100		150	3
2		Open Elective-III	3	0	0	30	20	50		100		150	3
3		Open Elective -IV	3	0	0	30	20	50		100		150	3
4	KCE851	Project	0	0	18				100		300	400	9
5		MOOCs (Essential for Hons. Degree)											
		Total	9	0	18							850	18

B. Tech (IV Year) VII Semester

Syllabus

ELECTIVE IV

KCE070	Railway, Waterway and Airway Engineering	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Explain the importance of railway infrastructure.
2. Identify the factors governing design of railway infrastructures.
3. Analysis and design the railway track system.
4. Understand the concepts of airport engineering and design components of airport.
5. Associate with the concepts of water transport system.

Unit	*Topics*	Lectures
I	Introduction to Permanent Way and its Components: History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. Sleepers, Timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications.	8
II	Track Geometrics, Turnouts and Crossings, Stations and Yards: Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning.	8
III	Signaling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high-speed technologies, Urban railway- railway system in urban areas.	8
IV	Introduction to Airport Engineering. Aircraft characteristics affecting airport planning &design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment.	8
V	Water Transport Harbors and ports, Types of Harbours; Harbours - layouts, shippin glanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses. Inland waterways: advantages and disadvantages; Development in India. Inland water operation.	8

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. Railway Engineering by M. M. Agrawal.

References

1. Railway Engineering by Rangwala (Charotar Publishing House).
2. Airport Engineering by Rangwala (Charotar Publishing House).
3. Airport Planning & Design by Khanna , Arora & Jain Nem Chand & Brothers).
4. Docs &Harbour Engineering by Bindra (Dhanpat Rai Publishing Company).

KCE071	Sustainable Construction Methods	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Classify the sustainable construction materials.
2. Apply cutting-edge construction technologies.
3. Evaluate different sustainable construction methods.
4. Apply different rating systems of construction/buildings as a professional.
5. Apply life cycle approach to optimize the performance of green construction materials

Unit	*Topics*	Lectures
I	Types of foundations and construction methods. Basics of Formwork and Staging. Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls). Modular construction methods for repetitive works.	8
II	Precast concrete construction methods. Basics of Slip forming for tall structures. Basic construction methods for steel structures. Basics of construction methods for Bridges.	8
III	dentification of cutting-edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity.	8
IV	Study and evaluation of current LEED and GRIHA rating for construction system. Detailed case study and analysis of highly successful recent "green construction projects". Guidance to students for the LEED Green Associate professional licensing examination.	8
V	Environmental impact of materials; life-cycle assessment; material selection to optimize performance; design, evaluation, and production of green construction materials.	8

References

1. **Rebecca L. Henn; Andrew J. Hoffman (2013),** Constructing Green the Social Structures of Sustainability (Urban and Industrial Environments), **MIT Press.**
2. Steve Goodhew Sustainable Construction Processes: A Resource Text ISBN: 978-1-405-18759-6 May 2016 Wiley-Blackwell.
3. Kim S. Elliott, Precast Concrete Structures – 12 June 2019, CRC Press Taylor and Francis.
4. S.B.Marinković, Life cycle assessment (LCA) aspects of concrete, Woodhead Publishing Series in Civil and Structural Engineering 2013, Pages 45-80

KCE072	Probability Methods in Civil Engineering	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Apply probabilistic techniques for the analysis of complex Civil Engineering structures using advanced techniques.
2. Demonstrate mathematical and statistical knowledge and skills to be applied in various civil engineering structures.
3. Apply the laws of logic to mathematical statements.
4. Develop mathematical thinking in the conduct of different experiments and presentation of results precisely.

Unit	*Topics*	Lectures
I	Introduction: Role of Probability in Civil Engineering Problems, Random Events: Definition of basic random events; Application of set theory in definition of composite event operations; Probability of events and definition of probability axioms; Solution of real life examples from Civil Engineering.	8
II	Random Variables: Definition of random variables – discrete and continuous; Probability definitions – PMF, PDF, CDF; Moments and expectations. Functions of Random Variables: Definition of probability distributions of functions of single random variables – exact methods and approximate methods; Moments and expectations of functions – direct and indirect methods.	8
III	Multiple Random Variables: Definition of joint, marginal, and conditional probability distributions; Definitions of moments and expectations, including the definition of correlation coefficient; Functions of multiple random variables.	8
IV	Common Probability Models: Discrete random variables – binomial distribution, Poisson's distribution; Continuous random variables – exponential distribution, gamma distribution; Central limit theorem; Normal and lognormal distributions.	8
V	Statistics and sampling: Goodness of fit tests; regression and correlation analyses; estimation of distribution parameters from statistics; hypothesis testing and significance; Bayesian updating of distributions.	8

References

1. Papoulis, A, and S. U. Pillai (2002), Probability, Random Variables and Stochastic Processes,McGraw-Hill, New York.
2. Richard A. Jonson and C. B. Gupta (2005), Miller and Freund's Probability and Statistics forEngineers, Pearson Education, Inc., United States.
3. West M. and J. Harrison (1997), Bayesian Forecasting and Dynamic Models, Springer-Verlag,New York.
4. Ang, A. H-S., and Tang, W., H. "Probability concepts in engineering: Emphasis on applications incivil and environmental engineering." Wiley.
5. Kottegoda, N. T., and Rosso, R. "Applied Statistics for Civil and Environmental Engineers."Wiley.
6. Ross, S. "A first course on probability." Prentice Hall.

KCE073	Advance Concrete Design	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Understand the design criteria as well as design concept of circular and rectangular tanks.
2. Design the Intz tank, RC domes and beams, cylindrical and rectangular tanks.
3. Understand the concept of pre tensioning and post tensioning and different systems used in pre tensioning.
4. Analysis and design the simple prestressed beams .
5. Design deep beams and corbel as per IS 456.

Unit	*Topics*	Lectures
I	Introduction to liquid retaining structures, design criteria, material specifications and permissible stresses for tanks, design concept of circular and rectangular tanks situated on the ground and underground.	8
II	Design of over-head tanks: design of RC domes and beams curved in plan, design ofcylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects.	8
III	ntroduction to prestressing, assumptions, general principles, advantages of prestressing, Axially placed tendons, bent tendons, parabolic tendons, load balancing concept, pressure line, systems of prestressing, pretensioning and post tensioning, Hoyer system, Freyssinet system,LeMccallsystem, Magnel-Blaton system, Gifford-Udall system, C.C.L standard system.	8
IV	Losses in prestress, IS 1343 recommendations for prestressed concrete, stages of loading tobe considered in design, handling and transportation of precast prestressed concrete beams, analysis and design of simple prestressed beams, Lever arm conception, kern distance.	8
V	Introduction to deep beams, minimum thickness, design of deep beams by IS 456, check forlocal failures, detailing of deep beams, Introduction to Corbels, Shear friction, Corbel dimensions, design of a corbel.	8

References

1. IS: 456 – 2000, “Code of Practice for Plain and Reinforced Concrete”, Bureau of Indian Standards, New Delhi.
2. IS 3370-2009, “Indian Standard concrete structures for storage of liquids - code of practice”, Bureau of Indian Standards, New Delhi
3. IS 1343-2012, “Indian Standard prestressed concrete - code of practice”, Bureau of Indian Standards, New Delhi
4. Shah. H.J.., “Reinforced Concrete Vol : 2”, Charotar publishing house Pvt. Ltd.
5. Varghese P.C. “Advanced Reinforced concrete design”, PHI learning Pvt. Ltd.
6. Ramamrutham S. and Narayan R. “Design of Reinforced Concrete Structures”, Dhanpat Rai Publishing company Pvt. Ltd.
7. Jain, A.K., “Reinforced Concrete: Limit State Design”, Nem Chand & Bros., Roorkee.
8. Punmia B.C, Jain A.K., “Limit State Design of Reinforced Concrete”, Laxmi Publications Pvt. Ltd.

KCE074	Solid Waste Management	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Understand the concept of solid waste management.
2. Explain handling and processing of solid waste.
3. Apply the concept of landfilling for disposal of solid waste.
4. Design composting and other solid waste conversion units.
5. Understand the various hazardous waste, risk assessment and legislation

Unit	*Topics*	Lectures
I	Solid waste: Public health and ecological impacts, Sources and types of solid wastes, material flow and waste generation, Functional elements: Waste generation, storage, collection, Transfer and transport, processing and recovery, disposal. Physical and chemical composition of municipal solid waste, integrated solid waste management, hierarchy of waste management options, different methods for generation rates. Storage: movable bins, fixed bins. Collection: home to home collection, community bin system. Theory and design of hauled container system, stationary container system.	8
II	Transportation: handcart, tri-cycle, animal cart, tripper truck, dumper placer, bulk refuse carrier, railroad transport, water transport, conveyors, layout of routes. Engineering system for on-site handling and processing of solid waste: separators, size reduction equipments, screening equipments, densification, baling, cubing, pelleting equipments.	8
III	Land filling: Site selection criteria, landfill layout, landfill sections, Occurrence of gases and leachate in landfills: composition and characteristics, generation factors, initial adjustment phase, transition phase, acid formation phase, methane formation phase, maturation phase of gases and leachate, Introduction to engineered landfills.	8
IV	Composting, types of composting, process description, design and operational consideration of aerobic composting, process description, design and operational consideration of anaerobic composting. Thermal conversion technologies: incineration and pyrolysis system, energy recovery, system. Overview of solid waste management practices in India.	8
V	Introduction to Hazardous wastes, Definition of Hazardous waste, The magnitude of the problem; Hazardous waste: Risk assessment, Environmental legislation, Characterization and site assessment, Waste minimization and resource recovery, Transportation of hazardous waste, Disposal of hazardous waste. Introduction to Electronic waste and Biomedical waste and their disposal.	8

References

1. Tchobanoglous, G., Theisen, H., & Vigil, S.A; Integrated Solid Waste Management: McGraw Hill,New York
2. Solid Waste Engineering, Principle & Management issues by Ven Te Chow
3. Bhide, A.D., B.B. Sundaresan, Solid Waste Management in developing countries.
4. Manual on Municipal solid Waste Management, CPHEEO, Govt. of India.

5. Guidelines for Management and Handling of Hazardous wastes MOEF (1991), Govt. of India.
6. Datta, M; Waste Disposal in Engineered Land fills, Narosa Publishers, Delhi.
7. Waste Management "Asian and Pacific Center for Transfer of Technology (N.D.) India", September1993.
8. Solid and Hazardous Waste Management: Science and Engineering by M.N. Rao, Razia Sultana &Sri Harsha Kota
9. E-Waste Management: From Waste to Resource by RamzyKahhat, Klaus Hieronymi, EricWilliams.
10. Biomedical Waste Management by R. Radhakrishan
11. Electronic Waste Management (Issues in Environmental Science and Technology) by R. E.Hester , R. M. Harrison & Martin T. Goosey

ELECTIVE V

KCE075	Design of Steel Structures	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Understand properties of steel and types of loads acting on steel structures.
2. Design welded and bolted type of connections for elementary steel structures.
3. Design tension members for elementary steel structures.
4. Design compression members such as simple columns, braced and latticed columns and column bases.
5. Design flexural members such as beams, purlins and girders

Unit	*Topics*	Lectures
I	**General Considerations:** Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements. **Introduction to Limit State Design:** Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions(Loads), Probabilistic Basis for Design, Design Criteria	8
II	**Simple Connections-–Riveted, Bolted and Pinned Connections:**Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections, Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints,Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections. **Simple Welded Connections:**Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections, Working Load Design.	8
III	**Tension Members:** Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design.	8

IV	**Compression Members:** Introduction, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members,Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases.	8
V	**Beams:** Introduction, Types of Sections, Behavior of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder.	8

Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
3. Design of Steel Structures by K S Sairam, Pearson Education
4. Design of Steel Structures by S Ramamurtham, DhanpatRai Publishing Company.

Reference Books

1. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
2. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
3. Design of steel structures by Willam T Segui , CENGAGE Learning
4. Structural Steel Design By D MacLaughlin , CENGAGE Learning

KCE076	Urban Transportation Planning	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Understand the basic concepts of planning at urban and regional levels.
2. Distinguish between the Conventional and current approaches for travel demand estimation.
3. Implement various types of models and trip generation.
4. Analyze the urban travel markets.
5. Evaluate the transport planning proposals.

Unit	*Topics*	Lectures
I	Introduction to transportation planning, planning concept, Goals, objective and Importance of transportation planning. Nature of traffic problems in cities. Present Scenario of road transport and rail transport assets. Role of transportation: Social, Political, Environmental. Transport and Socioeconomic Activities, Historical Development of Transport, Transportation in the Cities, Freight Transportation, Future Developments.	8
II	Urban form and Transport patterns, land use – transport cycle, concept of accessibility. Types of transport systems, evolution of transport modes, transport problems and mobility issues. Public Transport: Intermediate Public Transport (IPT) Rapid and mass transport system like MRTS & bus rapid transit. Transport Planning Process, Problem Definition, Solution Generation.	8
III	Travel demand: Estimation and fore casting, trip classification, trip generation: factor and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.	8
IV	Studying travel behavior. Analyzing urban travel markets. Traffic and transportation surveys and studies, traffic and travel characteristics, urban transport planning process – stages, study area, zoning, database.	8
V	Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods like Net present Value methods, Benefit Cost method. Transport system management: Long term and short term planning.	8

Text Book:

1. Khanna S. K., Justo C.E.G, &Veeraragavan, A. “Highway Engineering”, Nem Chand and Bros., Roorkee-247 667.
2. Kadiyali L. R., & Lal, N.B. “Principles and Practices of Highway Engineering (including Expressways and Airport Engineering)”, Khanna Publications, Delhi – 110 006

References:

1. Introduction to Transportation Engineering: William W. Hay.
2. Introduction to Transportation Engineering planning- E.K. Mortak.
3. Metropolitan Transportation planning-J.W. Dickey.
4. Traffic Engineering, L.R. Kadiyali
5. Hutchinson, B.G.(1974).Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, New York.
6. John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.

KCE077	Geo-synthetics and Reinforced Soil Structures	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Identify the type of Geosynthetic and their relevance.
2. Analyze &compute different properties of Geosynthetics.
3. Understand the emerging trends of Geosynthetic in geotechnical applications.
4. Design the Reinforced Earth Walls using Geosynthetic material.
5. Design the Reinforced Foundation using Geosynthetic materials.

Unit	*Topics*	Lectures
I	Introduction to Geosynthetics, types of geosynthetics, artificial and natural geosythetics and their applications, manufacture of geosynthetics, strength of reinforced soils, testing of Geosynthetics	8
II	Drainage application of geosynthetics, filtration applications of geosynthetics, erosion control using geosynthetics. Geosynthetics in flexible payment, introduction to geosyenthitcs in landfills, geosynthetics for construction of landfills.	8
III	Sustainable infrastructure development, different types of soil retaining structures, design codes for reinforced soil retaining walls, construction aspects of geosythetics reinforced soil retaining wall, testing requirements for reinforced soil retaining walls, geosynthetic reinforced soil embankments.	8
IV	Design of reinforced soil retaining walls – simple geometry, design of reinforced soil retaining walls – sloped backfill soil, soil embankments supported on geocell mattresses, geosynthetic reinforced pile systems for high embankments	8
V	Reinforced soil for supporting shallow foundations, response of footings resting on reinforced foundation soils, bearing capacity analysis of footings resting on reinforced foundation soils, carbon footprint analysis	8

References

1. Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123,CIRIA, Thomas Telford. London, UK, 1996.
3. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana,Asian Books Private Ltd., New Delhi, 2004.
4. Hoe I. Ling, Guido Gottardi , Daniele Cazzuffi , Jie Han , Fumio Tatsuoka “Design andPractice of Geosynthetic-Reinforced Soil Structures”
5. Sanjay Kumar Shukla, Erol Guler “Advances in Reinforced Soil Structures”

KCE078	Irrigation and Water Resource Engineering	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Describe the components of hydrological cycle, evaporation process and consumptive use.
2. Apply the knowledge of stream flow measurement techniques and hydrograph theory for computation of run-off.
3. Design different types of irrigation channels and water logging preventive measures.
4. Design the regulatory and control systems of canal and irrigation outlets.
5. Apply the knowledge of ground water hydrology and determination of discharge through wells.

Unit	*Topics*	Lectures
I	Hydrology: Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probabilistic maximum Precipitation(PMP) curves. Evaporation and consumptive use: Process affecting factors, estimation, and measurement techniques. Infiltration**:** Process affecting factors, measurement and estimation, Infiltration Indices	8
II	Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis. Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation. Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses.	8
III	Sediment Transportation: Suspended and Bed load and its estimation Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of anIrrigation channel, Computer programs for design of channels Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and	8

	anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains.	
IV	Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.	8
V	Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for tube well, Types of open wells, Methods of lifting water. Infiltration galleries.	8

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs& Wesley P. James, Pearson Publication.

References

1. Water Resources Engg. By Larry W. Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R. K. Linsley, McGraw Hill
4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and practices by A.M. Michel.
6. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.

KCE079	Disaster Preparedness and Management	3L:0T:0P	3Credits

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Understand the basic concepts of disasters and hazards
2. Classify the natural disasters.
3. Analyze the impacts of disaster on various societal components
4. Understand the components of disaster management cycle and roles of various agencies its risk reduction
5. Understand the process of recovery, reconstruction and development methods

Unit	*Topics*	Lectures
I	Introduction-Concepts and definitions: disaster, hazard, vulnerability, risks-severity, frequency and details, capacity, impact, prevention, mitigation.	8
II	Disasters-Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.	8
III	Disaster Impacts-Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.	8
IV	Disaster Risk Reduction (DRR)-Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.	8
V	Disasters, Environment and Development-Factors affecting vulnerability such asimpact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.	8

Text/Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

KCE 751	Concrete Lab	0L:0T:2P	1 Credits

1. Study of IS codes for (i) Aggregates (ii) Cements (iii) Admixtures (iv) Fly ash
2. Concrete Mix design computation by ACI 211.1-91 method, IS code method as per 10262-2019 & 456-2000, DOE method for given sample.
3. Preparation and testing of samples as per any one of the above mentioned computations (Minimum grade of concrete is M30)
4. Tests on Concrete- (a) Workability tests - Slump cone test, compaction factor test, Vee-bee consistometer test, flow table test. (b) Strength tests- compressive strength, flexural strength, split tensile strength.
5. Effects of Admixture - Accelerator, Retarder, Super Plasticizer.
6. Non destructive Testing - Rebound Hammer test, Ultrasonic Pulse Velocity test.

References:

1. Concrete Technology – A.M. Neville & J. J. Brooks , Pearson
2. Concrete Technology Theory & Practice-M.S. Shetty, S. Chand Publishers
3. Concrete Technology Theory & Practice-M.L. Gambhir, TMH Publishers
4. IS:10262-2019-Concrete Mix Proportioning Guidelines

KCE 752	Mini Project / Internship Assessment	0L:0T:2P	1 Credits

- Students will be asked to work upon minimum four of the following topics during the semester.
- They will submit the report of each topic containing following information (as per need of topic) like: introduction, general information, usage/application (if any) detailed description of work/process, relevant diagrams, drawings & tabulation (if any),observation and results (as applicable) or any other relevant information as per topic.

1. Work related to preparation of bill of quantity & tender document.
2. Work related to design & drawing of flat slab using IS code method.
3. Work related to cost estimation of (including market survey of rates by students) building/earthwork for a highway.
4. Work related to scheduling of activities of a project using relevant software
5. Work related to preparation of layout plan of a building and its marking on ground.
6. Design & analysis of a G+5 residential building using structural design and analysis software like STAAD Pro/STRUDS/SAP/ETAB/STRAP.
7. Work related to design of a small sewage treatment plant (STP) unit for a residential society.
8. Work related to computation of surface runoff & design of rain water harvesting system forgiven area (relevant software may be used for runoff computation).

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
UTTAR PRADESH, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

HUMANITIES, SCOCIAL SCIENCE AND MANAGEMENT COURSE (HSMC COURSE)

&

OPEN ELECTIVES II LIST

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session:2021-22]

Note:

1. The Student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the degree programme.
2. * It is mandatory that for these subjects (KOE069, KOE076, KOE087,KOE097 & KOE098) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

B.Tech. VII Semester (2021-22)

HUMANITIES, SCOCIAL SCIENCE AND MANAGEMENT COURSE (HSMC COURSE) HSMC1/HSMC2

KHU701/ KHU801	RURAL DEVELOPMENT: ADMINISTRATION AND PLANNING
KHU702/ KHU802	PROJECT MANAGEMENT & ENTREPRENEURSHIP

OPEN ELECTIVE-II

KOE071	FILTER DESIGN
KOE072	BIOECONOMICS
KOE073	MACHINE LEARNING
KOE074	RENEWABLE ENERGY RESOURCES
KOE075	OPERATIONS RESEARCH
KOE076	VISION FOR HUMANE SOCIETY
KOE077	DESIGN THINKING
KOE078	SOIL AND WATER CONSERVATION ENGINEERING
KOE079	INTRODUCTION TO WOMEN'S AND GENDER STUDIES

KHU701/ KHU801	**RURAL DEVELOPMENT: ADMINISTRATION AND PLANNING**	**3L:0T:0P**	**3 Credits**

COURSE OUTCOME: After completion of the course student will be able to:

1. Students can understand the definitions, concepts and components of Rural Development
2. Students will know the importance, structure, significance, resources of Indian rural economy.
3. Students will have a clear idea about the area development programmes and its impact.
4. Students will be able to acquire knowledge about rural entrepreneurship.
5. Students will be able to understand about the using of different methods for human resource planning

.

Unit	**Topics**	**Lectures**
I	**Rural Planning & Development:** Concepts of Rural Development, Basic elements of rural Development, and Importance of Rural Development for creation of Sustainable Livelihoods, An overview of Policies and Programmes for Rural Development- Programmes in the agricultural sector, Programmes in the Social Security, Programmes in area of Social Sector.	8
II	**Rural Development Programmes:** Sriniketan experiment, Gurgaon experiment, marthandam experiment, Baroda experiment, Firkha development scheme, Etawa pilot project, Nilokheri experiment,approaches to rural community development: Tagore, Gandhi etc	8
III	**Panchayati Raj & Rural Administration:** Administrative Structure: bureaucracy, structure of administration; Panchayati Raj Institutions Emergence and Growth of Panchayati Raj Institutions in India; People and Panchayati Raj; Financial Organizations in Panchayati Raj Institutions, Structure of rural finance, Government & Non-Government Organizations / Community Based Organizations, Concept of Self help group.	8
IV	**Human Resource Development in Rural Sector:** Need for Human Resource Development, Elements of Human Resource Development in Rural Sector Dimensions of HRD for rural development-Health, Education, Energy, Skill Development, Training, Nutritional Status access to basic amenities - Population composition.	8
V	**Rural Industrialization and Entrepreneurship:** Concept of Rural Industrialization, Gandhian approach to Rural Industrialization, Appropriate Technology for Rural Industries, Entrepreneurship and Rural Industrialization-Problems and diagnosis of Rural Entrepreneurship in India, with special reference to Women Entrepreneurship; Development of Small Entrepreneurs in India, need for and scope of entrepreneurship in Rural area.	8

Text Book:

1. Corporate Social Responsibility: An Ethical Approach - Mark S. Schwartz
2. Katar Singh: Rural Development in India – Theory History and Policy
3. TodaroM.P. Economic Development in III World war
4. Arora R.C – Integrated Rural Development in India
5. Dhandekar V.M and Rath N poverty in India
6. A.N.Agarwal and KundanaLal: Rural Economy of India
7. B.K.Prasad: Rural Development-Sarup& Son's Publications.

KHU702/ KHU802	**PROJECT MANAGEMENT & ENTREPRENEURSHIP**	**3L:0T:0P**	**3 Credits**

Unit	**Topics**	**Lectures**
I	**Entrepreneurship:** Entrepreneurship: need, scope , Entrepreneurial competencies & traits, Factors affecting entrepreneurial development, Entrepreneurial motivation (Mc Clellend's Achievement motivation theory), conceptual model of entrepreneurship , entrepreneur vs. intrapreneur; Classification of entrepreneurs; Entrepreneurial Development Programmes	8
II	**Entrepreneurial Idea and Innovation:** Introduction to Innovation, Entrepreneurial Idea Generation and Identifying Business Opportunities, Management skills for Entrepreneurs and managing for Value Creation, Creating and Sustaining Enterprising Model & Organizational Effectiveness	8
III	**Project Management:** Project management: meaning, scope & importance, role of project manager; project life-cycle Project appraisal: Preparation of a real time project feasibility report containing Technical appraisal,; Environmental appraisal, Market appraisal (including market survey for forecasting future demand and sales) and Managerial appraisal.	8
IV	**Project Financing:** Project cost estimation & working capital requirements, sources of funds, capital budgeting, Risk & uncertainty in project evaluation , preparation of projected financial statements viz. Projected balance sheet, projected income statement, projected funds & cash flow statements, Preparation of detailed project report, Project finance.	8
V	**Social Entrepreneurship:** Social Sector Perspectives and Social Entrepreneurship, Social Entrepreneurship Opportunities and Successful Models, Social Innovations and Sustainability, Marketing Management for Social Ventures, Risk Management in Social Enterprises, Legal Framework for Social Ventures.	8

Text Book:

1. Innovation and Entrepreneurship by Drucker, P.F.; Harper and Row
2. Business, Entrepreneurship and Management: Rao, V.S.P. ;Vikas
3. Entrepreneurship: Roy Rajeev; OUP.
4. Text Book of Project Management: Gopalkrishnan, P. and Ramamoorthy, V.E.; McMillan
5. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.; PHI
6. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.; MGH

KOE071	**FILTER DESIGN**	**3L:0T:0P**	**3 Credits**

COURSE OBJECTIVE: Students undergoing this course are expected to:

1. Understand about the characteristics of different filters.
2. Understand the concept of Approximation Theory.
3. Learn about the switched capacitor filter.

COURSE OUTCOME: After completion of the course student will be able to:

CO1	Choose an appropriate transform for the given signal.
CO2	Choose appropriate decimation and interpolation factors for high performance filters.
CO3	Model and design an AR system.
CO4	Implement filter algorithms on a given DSP processor platform.

Unit	Topics	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulationand modelling. Operational amplifiers: Op-amp models, Op-amp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analysing Op-amp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Op-amp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements,Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, "Analog Filter Design", 2ndIndianEdition, Oxford University Press.

Reference Books:

1. J. Michael Jacob, "Applications and Design with Analog Integrated Circuits", Second edition,Pearson.
2. T. Deliyannis, Yichuang Sun, J.K. Fidler, "Continuous-Time Active Filter Design",CRC Press.

KOE072	**BIOECONOMICS**	**3L:0T:0P**	**3 Credits**

OBJECTIVE:
This course is designed with an objective to provide an understanding of the basic knowledge of bioecomics to students so that they can explore entrepreneurship opportunities in the bio based industry. This course also serve interdisciplinary innovation in terms of sustainable bioeconomy

COURSE OUTCOME: After completion of the course student will be able to:

1. Students will be able to understand basic concept of Bioeconomics, challenges, opportunities& regulations
2. Students will be able to understand development and innovation in terms of bioeconomy towards sustainable development
3. Students will be able to understand Inter- and transdisciplinarity in bioeconomy &research approaches
4. Students will be able to explain biobased resources ,value chain, innovative use of biomass and biological knowledge to provide food, feed, industrial products

Unit	**Topics**	**Lectures**
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulationand modelling. Operational amplifiers: Op-amp models, Op-amp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analysing Op-amp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Op-amp resistor circuits.	8
II	Economic Growth, Development, and Innovation in terms of bioeconomy, Environmental Economics and the Role of Government, Modelling and Tools Supporting the Transition to a Bioeconomy, Role of biobased Economy in sustainable development.	8
III	Inter- and transdisciplinarity in Bioeconomy &research approaches, primary production, processing of biobased resources,Markets, Sustainability Management and Entrepreneurship in biobased products.	8
IV	Biobased Resources and Value Chains, Processing of Biobased Resources, Markets, Sustainability Management and Entrepreneurship opportunity in biobased product. Food Security and Healthy Nutrition in the Context of the Bioeconomy, Use of Biomass for the Production of Fuel and Chemicals, The importance of Biotechnology for the Bioeconomy.	8
V	sustainable and innovative use of biomass and biological knowledge to provide food, feed, industrial products, bioenergy and ecological services, importance of bioeconomy-related concepts in public, scientific, and political discourse, Dynamic Management of Fossil Fuel, Biofuel.	8

Text Book:

1. Principles of Bioeconomics by I. Sundar, Vedams eBooks (P) Ltd New Delhi, India
2. Bioeconomy:Shaping the Transition to a Sustainable, Biobased Economy by Iris Lewandowski, Springer.
3. Sociobiology and Bioeconomics by **Koslowski**, Peter
4. Modeling, Dynamics, Optimization and Bioeconomics I, by **Pinto**, Alberto Adrego, **Zilberman**, David, Springer.

KOE073	MACHINE LEARNING	**3L:0T:0P**	**3 Credits**

Unit	Topics	Lectures
I	INTRODUCTION – Well defined learning problems, Designing a Learning System, Issues in Machine Learning; THE CONCEPT LEARNING TASK - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias.	8
II	DECISION TREE LEARNING - Decision tree learning algorithm- Inductive bias- Issues in Decision tree learning; ARTIFICIAL NEURAL NETWORKS – Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks, Derivation of backpropagation rule Backpropagation AlgorithmConvergence, Generalization.	8
III	Evaluating Hypotheses: Estimating Hypotheses Accuracy, Basics of sampling Theory, Comparing Learning Algorithms; Bayesian Learning: Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm.	8
IV	Computational Learning Theory: Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning; INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	8
V	Genetic Algorithms: an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules- sequential covering algorithms-General to specific beam search-FOIL; REINFORCEMENT LEARNING - The Learning Task, Q learning.	8

Text Book:

1. Tom M. Mitchell,―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin,―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer- Verlag.

KOE074	**RENEWABLE ENERGY RESOURCES**	**3L:0T:0P**	**3 Credits**

Unit	Topics	Lectures
I	Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.	8
II	Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energystorage for solar heating and cooling, limitations.	8
III	Geothermal Energy: Resources of geothermal energy, thermodynamics of geo- thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Cells: Principle of working of various types of fuel cells and their working, performance and limitations.	8
IV	Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.	8
V	Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants.	8

Text Book:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, "Energy Resources: Conventional & Non-Conventional" BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle," Renewable Energy Power For A Sustainable Future", Oxford University Press.

KOE075	OPERATIONS RESEARCH	**3L:0T:0P**	**3Credits**

Unit	**Topics**	**Lectures**
I	Introduction: Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study. Linear Programming: Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.	8
II	Transportation Problems: Types of transportation problems, mathematical models, transportation algorithms, Assignment: Allocation and assignment problems and models, processing of job through machines.	8
III	Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. Project Management: Phases of project management, guidelines for network construction, CPM and PERT	8
IV	Theory of Games : Rectangular games, Minimax theorem, graphical solution of 2x n or mx2 games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized poisson queing model, single server models.	8
V	Inventory Control: Models of inventory, operation of inventory system, quantity discount. Replacement: Replacement models: Equipments that deteriorate with time, equipments that fail with time.	8

Text Book:

1. Wayne L. Winston,"Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

KOE-076	**VISION FOR HUMANE SOCIETY**	**3L:0T:0P**	**3 Credits**

Pre-requisites- for this subject only those faculty will teach these courses who had done the FDP for these courses.

Course Objectives:

1. To help the students to understand the importance and types of relationship with expressions.
2. To develop the competence to think about the conceptual framework of undivided society as well as universal human order.
3. To help the students to develop the exposure for transition from current state to the undivided society and universal human order.

Course Methodology:

1. The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or set of do's and don'ts related to values.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre- conditionings and present beliefs.

Unit	Topics	Lectures
I	Introduction to the course: Basic aspiration of a Human Being and program for its fulfilment, Need for family and relationship for a Human Being, Human-relationship and role of work in its fulfilment, Comprehensive Human Goal, Need for Undivided Society, Need for Universal Human Order, an appraisal of the Current State, Appraisal of Efforts in this Direction in Human History.	8
II	Understanding Human-Human Relationship & its fulfilment: Recognition of Human-Human Relationship, Recognition of feelings in relationship, Established Values and Expressed Values in Relationship, interrelatedness of feelings and their fulfilment, Expression of feelings, Types of relationship and their purpose, mutual evaluation in relationship, Meaning of justice in relationship, Justice leading to culture, civilization and Human Conduct.	8
III	Justice from family to world family order: Undivided Society as continuity and expanse of Justice in behaviour – family to world family order, continuity of culture and civilization, Universal Order on the basis of Undivided Society, Conceptual Framework for Universal human order, Universal Human Order as continuity and expanse of order in living: from family order to world family order, a conceptual framework for universal human order.	8

IV	Program for Ensuring Undivided Society and Universal Human Order: Education –Sanskar, Health –Sanyam, Production-work, Exchange – storage, Justice-preservation.	8
V	Human Tradition: Scope and Steps of Universal Human Order, Human Tradition (Ex. Family order to world family order), Steps for transition from the current state, Possibilities of participation of students in this direction, Present efforts in this direction, Sum up.	8

Text books:

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Asthana, G. P. Bagaria (2010), Excel Books, New Delhi.
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
3. An Appeal by the Dalai Lama to the World: Ethics Are More Important Than Religion, Dalai Lama XIV, 2015.
4. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India.
1. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA.
2. Human Society, Kingsley Davis, 1949.
3. Hind Swaraj or, Indian home rule Mohandas K. Gandhi, 1909.
4. Integral Humanism, Deendayal Upadhyaya, 1965.
5. Lohiya Ke Vichar, Lok Bharti , Rammanohar Lohiya, 2008.
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
8. Samadhanatmak Bhautikvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India
9. Small Is Beautiful: A Study of Economics as if People Mattered, E. F. Schumacher,1973, Blond & Briggs, UK.
10. Slow is Beautiful, Cecile Andrews (http://www.newsociety.com/Books/S/Slow-is- Beautiful)
11. Sociology Themes and Perspectives, Harper Collins; EIGHT edition (2014), Martin Holborn and Peter Langley, 1980.
12. Samagra kranti: Jaya Prakash Narayan's philosophy of social change, Siddharth Publications Renu Sinha, 1996.
13. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R. Gaur (1990), Commonwealth Publishers, New Delhi
14. Vyavaharvadi Samajshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
15. Vyavahatmak Janvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
16. The Communist Manifesto, Karl Marx, 1848.
17. Toward a True Kinship of Faiths: How the World's Religions Can Come Together Dalai Lama XIV, 2011

Reference Videos.

1. Kin school (30 minutes)
2. Technology (Solar City etc.).
3. Natural Farming.
4. Economics of Happiness (1h 8m).

KOE077	DESIGN THINKING	3L:0T:0P	3Credits

Objective: The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems

Unit	*Topics*	Lectures
I	Introduction to design thinking, traditional problem solving versus design thinking, history of design thinking, wicked problems. Innovation and creativity, the role of innovation and creativity in organizations, creativity in teams and their environments, design mindset. Introduction to elements and principles of design, 13 Musical Notes for Design Mindset, Examples of Great Design, Design Approaches across the world	8
II	Understanding humans as a combination of I (self) and body, basic physical needs up to actualization, prosperity, the gap between desires and actualization. Understanding culture in family society, institution, startup, socialization process. Ethical behavior: effects on self, society, understanding core values and feelings, negative sentiments and how to overcome them, definite human conduct: universal human goal, developing human consciousness in values, policy, and character. Understand stakeholders, techniques to empathize, identify key user problems. Empathy tools-Interviews, empathy maps, emotional mapping, immersion and observations, customer journey maps, and brainstorming, Classifying insights after Observations, Classifying Stakeholders, Do's & Don'ts for Brainstorming, Individual activity- 'Moccasin walk'	8
III	Defining the problem statement, creating personas, Point of View (POV) statements. Research- identifying drivers, information gathering, target groups, samples, and feedbacks. Idea Generation-basic design directions, Themes of Thinking, inspirations and references, brainstorming, inclusion, sketching and presenting ideas, idea evaluation, double diamond approach, analyze – four W's, 5 why's, "How Might We", Defining the problem using Ice-Cream Sticks, Metaphor & Random Association Technique, Mind-Map, ideation activity games - six thinking hats, million-dollar idea, introduction to visual collaboration and brainstorming tools - Mural, JamBoard	8
IV	Fundamental concepts of critical thinking, the difference between critical and ordinary thinking, characteristics of critical thinkers, critical thinking skills-linking ideas, structuring arguments, recognizing incongruences, five pillars of critical thinking, argumentation versus rhetoric, cognitive bias, tribalism, and politics. Case study on applying critical thinking on different scenarios.	8
V	The argument, claim, and statement, identifying premises and conclusion, truth and logic conditions, valid/invalid arguments, strong/weak arguments, deductive argument, argument diagrams, logical reasoning, scientific reasoning, logical fallacies, propositional logic, probability, and judgment, obstacles to critical thinking. Group activity/role plays on evaluating arguments.	8

Text Book:

1. Vijay Kumar, 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey
2. BP Banerjee, Foundations of Ethics and Management, 2005, Excel Books
3. Gavin Ambrose and Paul Harris, Basics Design 08: Design Thinking, 2010, AVA Publishing SA
4. Roger L. Martin, Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009, Harvard Business Press, Boston MA

Course Outcome: After successful completion of the course the students will be able to:

1. Develop a strong understanding of the design process and apply it in a variety of business settings
2. Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior
3. Formulate specific problem statements of real time issues and generate innovative ideas using design tools
4. Apply critical thinking skills in order to arrive at the root cause from a set of likely causes
5. Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments.

KOE078	SOIL AND WATER CONSERVATION ENGINEERING	3L:0T:0P	3Credits

Unit	*Topics*	Lectures
I	Definition and scope of soil conservation, cause of soil erosion, Mechanism of erosion, universal soil loss equation, soil erosion due to wind and its control, vegetation management, i.e., strip cropping, stubble mulching and other practices.	8
II	Types of soil erosion due to water- sheet erosion, rill erosion, gully erosion, sediment transport in channels, sediment deposition in reservoirs. Methods of soil erosion control: bounding and terracing on agriculture land for gully control, bench terraces, vegetated water ways, chute spillways, drop inlet spillways, check dams, river training works.	8
III	Biological methods of soil erosion control, grass land management, forest management. Soil quality management, drainage works, reclamation of salt affected soils. Water conservation: water harvesting, rainfall- run off relation, water storage in ponds, lakes, reservoirs and aquifers, groundwater recharge through wells, check dams and storage works.	8
IV	Water losses: filtration, seepage and evaporation losses, pollution/ contamination of water quality due to agricultural practices i.e., fertilizers and pesticides, self purification of surface water, sources of agricultural water pollution, pollutant dispersion in ground water.	8
V	Need of planned utilization of water resources, economics of water resources utilization. Flood plain zones management, modifying the flood, reducing susceptibility to damage, reducing the impact of flooding.	8

Suggested reading:

1. Alam Singh – Modern Geotechnical Engineering
2. K. R. Arora – Soil Mechanics and foundation Engineering.
3. N. C. Brady – Principles of Soil Sciences
4. B. C. Punmia – Soil Mechanics and Foundation Engineering

KOE079	INTRODUCTION TO WOMEN'S AND GENDER STUDIES	3L:0T:0P	3Credits

Unit	*Topics*	Lectures
I	**Women and Society:** Understanding Sex- Gender, Gender shaping Institutions, Theories of Gender construction Understanding Sexism and Androcentrism, Understanding Patriarchy and Theories of Patriarchy, Private and Public dichotomy, Sexual Division of Work, Patriarchy practices in different institutions and Text Books.	8
II	**Feminist Theory:** Rise of Feminism, Introduction to various stands of Feminism- Liberal Feminism, Radical Feminism, Marxist Feminism, Socialist Feminism, Cultural Feminism, Eco-Feminism, Post Colonial Feminism, Post Modern Feminism. Waves of Feminism.	8
III	**Women's Movement:** The socio-economic conditions of women during the age of Industrial revolution the Call for Women's Rights 1848, Women's rights movement 1848-1920,Historical Developments of Social Reform Movements in India , Women's groups and organizations, Women's Movement Movements for Uniform Civil code and ShahBano case, Dalit women and the question of double marginality.	8
IV	**Gender Roles and Psychology of Sex:** Difference Conceptualization of gender roles and gender role attitudes, Gender: Aggression, Achievement, Communication, Friendship and Romantic, Relationships Sex Differences in Mental Health Trauma relating to Rape , Taboo , Childhood Sexual Abuse , Domestic Violence , Sexual Harassment at Work Place, Educational Institutions, Eve Teasing etc.	8
V	**Gender and Representation:** Gender and Mass Media- Print Media, Gender and Mass Media-Electronic Media, Gender and Films, Advertisements, Mega Serials, Stereotyping and breaking the norms of women's roles Women's Representation in Literary Texts.	8

Suggested reading:

5. Basab iChakrabarti, Women's Studies: Various Aspects. UrbiPrakashani2014
6. Arvind Narrain. Queer: Despised Sexuality Law and Social Change. Book for Change. 2005
7. Chandra Talpade Mohanty, Feminism without Borders: Decolonizing Theory, Practicing Solidarity. Duke University Press.
8. Flavia Agnes. Law and Gender Inequality: The Politics of Women's Rights in India. Oxford University Press, 2001
9. Sonia Bathla, Women, Democracy and the Media: Cultural and Political Representations in the Indian Press, Sage, New Delhi, 1998.

OPEN ELECTIVE –IV

KOE-090	**ELECTRIC VEHICLES**
KOE-091	AUTOMATION AND ROBOTICS
KOE-092	COMPUTERIZED PROCESS CONTROL
KOE-093	DATA WAREHOUSING & DATA MINING
KOE-094	DIGITAL AND SOCIAL MEDIA MARKETING
KOE-095	MODELING OF FIELD-EFFECT NANO DEVICES
KOE-096	MODELLING AND SIMULATION OF DYNAMIC SYSTEMS
KOE-097	BIG DATA
KOE-098	**HUMAN VALUES IN BUDDHA AND JAIN DARSHAN
KOE-099	**HUMAN VALUES IN VEDIC DARSANA

** It is mandatory that for these subjects (KOE098 & KOE099) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

KOE094: DIGITAL AND SOCIAL MEDIA MARKETING		
DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	Introduction to Digital Marketing: The new digital world - trends that are driving shifts from traditional marketing practices to digital marketing practices, the modern digital consumer and new consumer's digital journey. Marketing strategies for the digital world-latest practices.	08
II	Social Media Marketing -Introduction to Blogging, Create a blog post for your project. Include headline, imagery, links and post, Content Planning and writing. Introduction to Face book, Twitter, Google +, LinkedIn, YouTube, Instagram and Pinterest; their channel advertising and campaigns.	08
III	Acquiring & Engaging Users through Digital Channels: Understanding the relationship between content and branding and its impact on sales, search engine marketing, mobile marketing, video marketing, and social-media marketing. Marketing gamification, Online campaign management; using marketing analytic tools to segment, target and position; overview of search engine optimization (SEO).	08
IV	Designing Organization for Digital Success: Digital transformation, digital leadership principles, online P.R. and reputation management. ROI of digital strategies, how digital marketing is adding value to business, and evaluating cost effectiveness of digital strategies.	08
V	Digital Innovation and Trends: The contemporary digital revolution, digital transformation framework; security and privatization issues with digital marketing Understanding trends in digital marketing – Indian and global context, online communities and co-creation.	08

Text Books:

1. Moutsy Maiti: Internet Mareting, Oxford University Press India
2. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
3. Eric Greenberg, and Kates, Alexander; Strategic Digital Marketing: Top Digital Experts
4. Share the Formula for Tangible Returns on Your Marketing Investment; McGraw-Hill Professional.
5. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page.
6. Tracy L. Tuten & Michael R. Solomon: Social Media Marketing (Sage Publication)

OPEN ELECTIVE –III

KOE-080	**FUNDAMENTALS OF DRONE TECHNOLOGY**
KOE-081	**CLOUD COMPUTING**
KOE-082	**BIO MEDICAL SIGNAL PROCESSING**
KOE-083	**ENTREPRENEURSHIP DEVELOPMENT**
KOE-084	**INTRODUCTION TO SMART GRID**
KOE-085	**QUALITY MANAGEMENT**
KOE-086	**INDUSTRIAL OPTIMIZATION TECHNIQUES**
KOE-087	**VIROLOGY**
KOE-088	**NATURAL LANGUAGE PROCESSING**
KOE-089	****HUMAN VALUES IN MADHYASTH DARSHAN**

** It is mandatory that for these subjects (KOE089) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

KOE085: QUALITY MANAGEMENT		
DETAILED SYLLABUS		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	Quality Concepts: Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. Control on Purchased Product: Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. Manufacturing Quality: Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.	08
II	Quality Management: Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.	08
III	Control Charts, Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. Attributes of Control Chart, Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts	08
IV	Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.	08
V	ISO-9000 and its concept of Quality Management, ISO 9000 series, Taguchi method, JIT in some details.	08

Text Books:

1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, .
2. Greg Bounds, "Beyond Total Quality Management",McGraw Hill
3. Menon, H.G, "TQM in New Product manufacturing",McGraw Hill

KOE076	**VISION FOR HUMANE SOCIETY**	**3L:0T:0P**	**3 Credits**

Pre-requisites- for this subject only those faculty will teach these courses who had done the FDP for these courses.

Course Objectives:

1. To help the students to understand the importance and types of relationship with expressions.
2. To develop the competence to think about the conceptual framework of undivided society as well as universal human order.
3. To help the students to develop the exposure for transition from current state to the undivided society and universal human order.

Course Methodology:

1. The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or set of do's and don'ts related to values.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre- conditionings and present beliefs.

Unit	Topics	Lectures
I	Introduction to the course: Basic aspiration of a Human Being and program for its fulfilment, Need for family and relationship for a Human Being, Human-relationship and role of work in its fulfilment, Comprehensive Human Goal, Need for Undivided Society, Need for Universal Human Order, an appraisal of the Current State, Appraisal of Efforts in this Direction in Human History.	8
II	Understanding Human-Human Relationship & its fulfilment: Recognition of Human-Human Relationship, Recognition of feelings in relationship, Established Values and Expressed Values in Relationship, interrelatedness of feelings and their fulfilment, Expression of feelings, Types of relationship and their purpose, mutual evaluation in relationship, Meaning of justice in relationship, Justice leading to culture, civilization and Human Conduct.	8
III	Justice from family to world family order: Undivided Society as continuity and expanse of Justice in behaviour – family to world family order, continuity of culture and civilization, Universal Order on the basis of Undivided Society, Conceptual Framework for Universal human order, Universal Human Order as continuity and expanse of order in living: from family order to world family order, a conceptual framework for universal human order.	8

IV	Program for Ensuring Undivided Society and Universal Human Order: Education –Sanskar, Health –Sanyam, Production-work, Exchange – storage, Justice-preservation.	8
V	Human Tradition: Scope and Steps of Universal Human Order, Human Tradition (Ex. Family order to world family order), Steps for transition from the current state, Possibilities of participation of students in this direction, Present efforts in this direction, Sum up.	8

Text books:

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Asthana, G. P. Bagaria (2010), Excel Books, New Delhi.
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
3. An Appeal by the Dalai Lama to the World: Ethics Are More Important Than Religion, Dalai Lama XIV, 2015.
4. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India.
1. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA.
2. Human Society, Kingsley Davis, 1949.
3. Hind Swaraj or, Indian home rule Mohandas K. Gandhi, 1909.
4. Integral Humanism, Deendayal Upadhyaya, 1965.
5. Lohiya Ke Vichar, Lok Bharti , Rammanohar Lohiya, 2008.
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
8. Samadhanatmak Bhautikvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India
9. Small Is Beautiful: A Study of Economics as if People Mattered, E. F. Schumacher,1973, Blond & Briggs, UK.
10. Slow is Beautiful, Cecile Andrews (http://www.newsociety.com/Books/S/Slow-is- Beautiful)
11. Sociology Themes and Perspectives, Harper Collins; EIGHT edition (2014), Martin Holborn and Peter Langley, 1980.
12. Samagra kranti: Jaya Prakash Narayan's philosophy of social change, Siddharth Publications Renu Sinha, 1996.
13. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R. Gaur (1990), Commonwealth Publishers, New Delhi
14. Vyavaharvadi Samajshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
15. Vyavahatmak Janvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
16. The Communist Manifesto, Karl Marx, 1848.
17. Toward a True Kinship of Faiths: How the World's Religions Can Come Together Dalai Lama XIV, 2011

Reference Videos.

1. Kin school (30 minutes)
2. Technology (Solar City etc.).
3. Natural Farming.
4. Economics of Happiness (1h 8m).