Revised Structure B. Tech 1st Year (Common)

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

REVISED EVALUATION SCHEME
&
SYLLABUS

FOR

B. TECH. I YEAR

(All Branch except Agriculture (AG) and Biotechnology (BT)

ON

AICTE MODEL CURRICULUM)

[Effective from the Session: 2020-21]

Director
Moradabad Institute of Technology
Ram Ganga Vihar, Phase-2
Moradabad

Revised Structure B. Tech 1st Year (Common)

UG Stream Vs Allied Branch Classification 2020-21		Code
Stream	**Branch Name**	
Civil Engineering	Civil Engineering	CE
	Environmental Engineering	EV
Chemical Engineering	Chemical Engineering	CH
	Food Technology	FT
Computer Science	Computer Engineering (2019-20)	CS
	Computer Science	CS
	Computer Science and Engineering (CS)	**CSE**
	Computer Engineering And Information Technology	CSA
	Computer Science and Information Technology	CSIT
	Information Technology	IT
	Computer Science and Engineering (Artificial Intelligence) 2020-21	CSAI
	Computer Science and Engineering(Artificial Intelligence & Machine Learning) 2020-21	CSME
	Computer Science and Engineering (Data Science) 2020-21	CSDS
	Computer Science and Engineering (Internet Of Things) 2020-21	CSIOT
Electrical Engineering	Electrical Engineering	EE
	Electrical & Electronics Engineering	EN
Electronics Engineering	Applied Electronics & Instrumentation	AI
	Bio Medical Engineering	BM
	Instrumentation and Control Engineering, Instrumentation Engineering	IC
	Electronics Engineering	EL
	Electronics and Communication Engineering	EC
	Electronics And Computer Engineering	
	Electronics and Instrumentation Engineering	EI
	Electronics & Telecommunication Engineering	ET
Mechanical Engineering	Aeronautical Engineering	AE
	Automobile Engineering	AU
	Industrial Production Engineering	IP
	Manufacturing Technology	MT
	Mechanical and Industrial Engineering	MI
	Mechanical Engineering	ME
	Plastic Engineering	PL
	Production Engineering	PE
Textile Engineering	Carpet & Textile Chemistry	CT
	Textile Chemistry	TC
	Textile Technology	TT
	Handloom & Textile Technology 2020-21	HTT

Director
Moradabad Institute of Technology
Ram Ganga Vihar, Phase-2
Moradabad

Revised Structure B. Tech 1st Year

B. Tech 1st Year
(All branches except Bio Technology and Agriculture Engg.)
Revised Structure in accordance with AICTE Model Curriculum
Effective w.e.f. Academic Session 2020-21

SEMESTER I

3 WEEKS COMPULSORY INDUCTION PROGRAM

AICTE Guidelines in Model Curriculum: After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

Revised Structure B. Tech 1st Year

B.Tech. I Semester

(All branches except Bio Technology and Agriculture Engg.)

S. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KAS101T/ KAS102T	Engineering Physics/ Engineering Chemistry	3	1	0	30	20	50		100		150	4
2	KAS103T	Engineering Mathematics-I	3	1	0	30	20	50		100		150	4
3	KEE101T/ KEC101T	Basic Electrical Engineering/ Emerging Domain in Electronics Engineering	3	0	0	30	20	50		100		150	3
4	KCS101T/ KME101T	Programming for Problem Solving / Fundamentals of Mechanical Engineering & Mechatronics	3	0	0	30	20	50		100		150	3
5	KAS151P/ KAS152P	Engineering Physics Lab/ Engineering Chemistry Lab	0	0	2				25		25	50	1
6	KEE151P/ KEC151P	Basic Electrical Engineering Lab/ Electronics Engineering Lab	0	0	2				25		25	50	1
7	KCS151P/ KAS154P	Programming for Problem Solving / English Language Lab	0	1	2				25		25	50	1
8	KCE151P/ KWS151P	Engineering Graphics & Design Lab/ Mechanical Workshop Lab	0	1	2				50		50	100	1
9	KMC101/ KMC102	AI For Engineering/ Emerging Technology for Engineering	2	0	0	15	10	25		25		50	2
10	**KNC101**	**Soft Skill I**	2	0	0	15	10	25		25			NC
11	MOOCs	(For B.Tech. Hons. Degree)*											
		Total										900	20

B.Tech. II Semester

(All branches except Bio Technology and Agriculture Engg.)

S. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KAS201T/ KAS202T	Engineering Physics/ Engineering Chemistry	3	1	0	30	20	50		100		150	4
2	KAS203T	Engineering Mathematics-II	3	1	0	30	20	50		100		150	4
3	KEE201T/ KEC201T	Basic Electrical Engineering/ Emerging Domain in Electronics Engineering	3	0	0	30	20	50		100		150	3
4	KCS201T/ KME201T	Programming for Problem Solving / Fundamentals of Mechanical Engineering & Mechatronics	3	0	0	30	20	50		100		150	3
5	KAS251P/ KAS252P	Engineering Physics Lab/ Engineering Chemistry Lab	0	0	2				25		25	50	1
6	KEE251P/ KEC251P	Basic Electrical Engineering Lab/ Electronics Engineering Lab	0	0	2				25		25	50	1
7	KCS251P/ KAS254P	Programming for Problem Solving / English Language Lab	0	1	2				25		25	50	1
8	KCE251P/ KWS251P	Engineering Graphics & Design Lab/ Mechanical Workshop Lab	0	1	2				50		50	100	1
9	KMC201/ KMC202	AI For Engineering/ Emerging Technology for Engineering	2	0	0	15	10	25		25		50	2
10	**KNC201**	**Soft Skill II**	2	0	0	15	10	25		25			NC
	MOOCs	(For B.Tech. Hons. Degree)*											
		Total										900	20

Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester

B.Tech 1st Year
I Semester
Syllabus

KAS-101T KAS-201T	ENGINEERING PHYSICS	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	**Relativistic Mechanics:** Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson- Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein"s mass energy relation, Relativistic relation between energy and momentum, Massless particle.	8
II	**Electromagnetic Field Theory:** Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell"s equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.	8
III	**Quantum Mechanics:** Black body radiation, Stefan"s law, Wien"s law, Rayleigh-Jeans law and Planck"s law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.	8
IV	**Wave Optics:** Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh"s criterion of resolution, Resolving power of grating.	8
V	**Fibre Optics & Laser:** Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres. Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein"s coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.	8

Reference Books:

1. Concepts of Modern Physics – Aurthur Beiser (McGraw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics – Brijlal & Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

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

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

KAS-102T KAS-202T	ENGINEERRING CHEMISTRY	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	**Atomic and Molecular Structure:** Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nano-materials and its application.	8
II	**Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.	8
III	**Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery. **Corrosion**; causes, effects and its prevention. **Phase Rule** and its application to water system.	8
IV	**Water Analysis;** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method). **Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulong's methods).	8
V	**Polymer;** Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organo metallic compounds (Grignard reagent) and their applications.	8

Text Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry By Fre W., Billmeyer
7. Engineering Chemistry By Satya Prakash

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

1. Use of different analytical instruments.
2. Measure molecular/ system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

KAS 103T	ENGINEERING MATHMATICS I	3L:1T:0P	4 Credits

COURSE OBJECTIVE:

The objective of this course is to familiarize the graduate engineers with techniques in calculus, multivariate analysis, vector calculus and linear algebra. It aims to equip the students with standard concepts and tools from intermediate to advanced level that will enable them to tackle more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn:

- To apply the knowledge of differential calculus in the field of engineering.
- To deal with functions of several variables that is essential in optimizing the results of real life problems.
- Multiple integral tools to deal with engineering problems involving centre of gravity, volume etc.
- To deal with vector calculus that is required in different branches of Engineering to graduate engineers.
- The essential tools of matrices and linear algebra, Eigen values and diagonalization in a Comprehensive manner are required.

Unit	Topics	Lectures
I	**Matrices:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix	8
II	**Differential Calculus- I:** Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope of family of one and two parameter, Curve tracing: Cartesian and Polar co-ordinates	8
III	**Differential Calculus-II:** Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors	8
IV	**Multivariable Calculus-I: Multiple integration:** Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities)	8
V	**Vector Calculus:** Vector identities (without proof), Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem (without proof) and their applications	8

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
6. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, McGraw-Hill; Sixth Edition.
7. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson Education.
8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.
9. Engineering Mathemathics – I. Reena Garg, 2018.

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

	Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
CO 1	Remember the concept of matrices and apply for solving linear simultaneous equations.	K_1 & K_3
CO 2	Understand the concept of limit , continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .	K_2 & K_3
CO 3	Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.	K_3 &K_5
CO 4	Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.	K_2 & K_3
CO 5	Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.	K_2 & K_5

KAS 203T	ENGINEERING MATHMATICS II	3L:1T:0P	4 Credits

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

COURSE OBJECTIVE:

The objective of this course is to familiarize the prospective engineers with techniques in sequences, multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

The students will learn:

- The effective mathematical tools for the solutions of differential equations that model physical processes
- To apply integral calculus in various field of engineering. Apart from some other applications students will have a basic understanding of Beta and Gamma functions.
- The tool of Fourier series for learning advanced Engineering Mathematics.
- The tools of differentiation of functions of complex variables that are used in various techniques dealing with engineering problems.
- The tools of integration of functions of complex variables that are used in various techniques dealing with engineering problems.

Unit	Topic	Lectures
I	**Ordinary Differential Equation of Higher Order:** Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation.	8
II	**Multivariable Calculus-II:** Introduction of Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.	8
III	**Sequences and Series:** Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.	8
IV	**Complex Variable–Differentiation:** Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties.	8
V	**Complex Variable –Integration:** Complex integrals, Contour integrals, Cauchy- Integral theorem, Cauchy integral formula, Taylor's and Laurent's series (without proof), Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the types $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$, $\int_0^{\pi} f(\cos\theta, \sin\theta) d\theta$ and $\int_{-\pi}^{\pi} f(\cos\theta, \sin\theta) d\theta$ only.	8

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger, Advance Engineering Mathematics , Narosa Publishing - House, 2002

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8^{th} Edition-McGraw-Hill
6. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6^{th}Edition, McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1^{st} Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi.

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

	Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of this course, the students will be able to:		
CO 1	Understand the concept of differentiation and apply for solving differential equations.	K_2 & K_3
CO 2	Remember the concept of definite integral and apply for evaluating surface areas and volumes.	K_1, K_3 & K_5
CO 3	Understand the concept of convergence of sequence and series. Also evaluate Fourier series	K_2 &K_5
CO 4	Illustrate the working methods of complex functions and apply for finding analytic functions.	K_3
CO 5	Apply the concept of complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.	K_3 & K_5

KAS-151P KAS-251P	PHYSICS LAB	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

Group A

1. To determine the wavelength of sodium light by Newton"s ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel"s bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan"s law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistanceusing Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

List of Experiments: Any ten experiments (at least four from each group) with virtual link

	Group A	Virtual Lab Link	Alternate Lab Link
1	To determine the wavelength of sodium light by Newton's ring experiment.	https://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=1	http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/engg_physics/labs/exp1/simulation/simulator4.html?medium=1
2	To determine the wavelength of different spectral lines of mercury light using plane transmission grating.	http://vlab.amrita.edu/?sub=1&brch=281&sim=334&cnt=1	
3	To determine the specific rotation of cane sugar solution using polarimeter		http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/cane-sugar-rotation-iitk/simulation.html
4	To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.		http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/focal-length-measurement-iitk/simulation.html

5	To measure attenuation in an optical fiber.	http://vlab.amrita.edu/index.php?sub=59&brch=269&sim=1369&cnt=2873	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/numerical-aperture-measurement-iitk/simulation.html
6	To determine the wavelength of He-Ne laser light using single slit diffraction.	http://vlab.amrita.edu/index.php/index.php?sub=1&brch=189&sim=334&cnt=1	https://youtu.be/0qIN2qHCvvs (Laser diffraction grating)
7	To study the polarization of light using He-Ne laser light.		http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/he-ne-laser-polarization-iitk/simulation.html
8	To determine the wavelength of sodium light with the help of Fresnel's bi-prism	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/fresnel-biprism-iitk/simulation.html	-
9	To determine the coefficient of viscosity of a given liquid.	https://amrita.olabs.edu.in/?sub=1&brch=5&sim=225&cnt=2	
10	To determine the value of acceleration due to gravity (g) using compound pendulum.	http://vlab.amrita.edu/?sub=1&brch=280&sim=210&cnt=2	
	Group B		
1	To determine the energy band gap of a given semiconductor material.	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/energy-band-gap-iitk/simulation.html	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/energy-band-gap-iitk/simulation.html
2	To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.	https://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1	https://youtu.be/lUugrqMOY7E (Hall Effect)
3	To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.	http://vlab.amrita.edu/?sub=1&brch=192&sim=972&cnt=1	https://youtu.be/v2B0QyW8XJ0 (Variation of Magnetic Field along the axis of circular coil carrying current)
4	To verify Stefan's law by electric method..	http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/vlabs_recbanda/labs/exp1/index.html	https://youtu.be/qyFQ31s-bAw(Stefans law verification)
5	To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.	https://vlab.amrita.edu/?sub=1&brch=192&sim=346&cnt=1	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/carey-foster-bridge-iitk/simulation.html
6	To study the resonance condition of a series LCR circuit.	https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1	
7	To determine the electrochemical equivalent (ECE) of copper.	http://learnphysics-dhruv.blogspot.com/2015/03/copper-voltameter-to-determine-electro.html	https://youtu.be/drV2nbDjR1k (ECE of Copper experiment)
8	To calibrate the given ammeter and voltmeter by potentiometer.		
9	To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.	-	
10	To measure high resistance by leakage method	http://vlabs.iitb.ac.in/vlabs-dev/labs/physics-basics/labs/carey-foster-bridge-iitk/simulation.html	

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar & Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton‟s ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel‟s bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

KAS-152P KAS-252P	CHEMISTRY LAB	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

List of Experiments: Any ten experiments with virtual link

SN	Lab Practical	Virtual Lab Link
1	Determination of alkalinity in the given water sample.	https://vlab.amrita.edu/?sub=2&brch=193&sim=1548&cnt=1
2	Determination of temporary and permanent hardness in water sample using EDTA.	http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk_labs/Environmental_Engineering_1/labs/determination-of-hardness-nitk/simulation.html
3	Determination of iron content in the given solution by Mohr's method.	https://vlab.amrita.edu/?sub=2&brch=193&sim=352&cnt=1
4	Determination of viscosity of given liquid.	http://vlab.amrita.edu/?sub=3&brch=190&sim=339&cnt=1
5	Determination of surface tension of given liquid.	https://amrita.olabs.edu.in/?sub=1&brch=5&sim=224&cnt=7
6	Determination of chloride content in water sample.	http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk_labs/Environmental_Engineering_1/labs/determination-of-hardness-nitk/index.html

7	Determination of available chlorine in bleaching powder.	E bootathon 04
8	Determination of pH by pH-metric titration.	https://vlab.amrita.edu/?sub=2&brch=193&sim=352&cnt=1
9	Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.	E bootathon 01.
10	Determination of Cell constant and conductance of a solution.	http://vlab.amrita.edu/?sub=3&brch=193&sim=575&cnt=1
11	Determination of rate constant of hydrolysis of esters.	E bootathon 04
12	Verification of Beer's law.	http://vlab.amrita.edu/?sub=3&brch=206&sim=569&cnt=975

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

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity,
3. Measure conductance of solution, chloride and iron content in water, hardness of water.
4. Estimate the rate constant of reaction.

KEE-101T KEE-201T	ELECTRICAL ENGINEERING	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**DC Circuits :** Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.	8
II	**Steady- State Analysis of Single Phase AC Circuits:** Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidal varying voltage and current. Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor. Three phase balanced circuits, voltage and current relations in star and delta connections.	8
III	**Transformers:** Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.	8
IV	**Electrical machines: DC machines:** Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems) **Three Phase Induction Motor:** Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only) **Single Phase Induction motor:** Principle of operation and introduction to methods of starting, applications. **Three Phase Synchronous Machines:** Principle of operation of alternator and synchronous motor and their applications.	8
V	**Electrical Installations:** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries. Elementary calculations for energy consumption and savings, battery backup.	8

Text Book:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", McGraw Hill.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.
3. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.
4. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

Spoken Tutorial (MOOCs): Open Source Spice circuit Simulator Software

1. AC DC Circuit Analysis using NgSpice, Open Source Spice circuit Simulator Software (http://spoken- tutorial.org)

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

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

KEC-101T KEC-201T	EMERGING DOMAIN IN ELECTRONICS ENGINEERING	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Semiconductor Diode**: Depletion layer, V-I characteristics, ideal and practical Diodes, Diode Equivalent Circuits, Zener Diodes breakdown mechanism (Zener and avalanche) **Diode Application:** Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits **Special Purpose two terminal Devices:** Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes, Liquid-Crystal Displays.	3 3 2
II	**Bipolar Junction Transistor:** Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration **Field Effect Transistor:** Construction and Characteristic of JFETs. Transfer Characteristic. MOSFET (MOS) (Depletion and Enhancement) Type, Transfer Characteristic.	4 4
III	**Operational Amplifiers:** Introduction, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Non-inverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator).Differential and Common-Mode Operation, Comparators. **Introduction of IoT System,** Components of IoT system: Microprocessor and Microcontroller, Bluetooth Technology, Wi-Fi Technology, Concept of Networking, Sensor Nodes, concept of cloud.	4 4
IV	**Digital Electronics:** Number system & representation. Introduction of Basic and Universal Gates, using Boolean algebra simplification of Boolean function. K Map Minimization upto 6 Variable. **Introduction To IC Technology:** SSI, MSI, LSI, VLSI Integrated Circuits.	6 2
V	**Fundamentals of Communication Engineering:** Basics of signal representation and analysis, Electromagnetic spectrum Elements of a Communication System, Need of modulation and typical applications, Fundamentals of amplitude modulation and demodulation techniques. **Introduction to Data Communications:** Goals and applications of Networks. **General Model of Wireless Communication: E**volution of mobile radio communication fundamentals, GPRS, GSM, CDMA. Elements of Satellite & Radar Communication,	4 4

Text Books:

1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", McGraw Publication
3. George Kennedy, "Electronic Communication Systems", McGraw Publication
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
5. Jacob Millman, C.C. Halkias, Staya brataJit, "Electronic Devices and Circuits", McGraw Hill
6. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India

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

1. Understand the concept of PN Junction and devices.
2. Understand the concept of BJT, FET and MOFET.
3. Understand the concept of Operational amplifier
4. Understand the concept of measurement instrument.
5. Understand the working principle of different type of sensor and their uses.
6. Understand the concept of IoT system & Understand the component of IoT system

KCS-101T KCS-201T	PROGRAMMING FOR PROBLEM SOLVING	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Introduction to Programming: Introduction to components of a computer system:** Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker. **Idea of Algorithm:** Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. **Programming Basics:** Structure of C program: writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language: Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.	8
II	**Arithmetic expressions & Conditional Branching: Arithmetic expressions and precedence:** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively. **Conditional Branching:** Applying if and switch statements, nesting if and else, use of break and default with switch.	8
III	**Loops & Functions: Iteration and loops:** use of while, do while and for loops, multiple loop variables, use of break and continue statements. **Functions:** Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.	8
IV	**Arrays & Basic Algorithms: Arrays:** Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. **Basic Algorithms:** Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.	8
V	**Pointer& File Handling: Pointers:** Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) **File handling:** File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.	8

Text Books:

1. Schum"s Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.

7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House.

Course Outcomes: At the end of this course students will be able to:

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

KME-101T KME-201T	FUNDAMENTAL OF MECHANICAL ENGINEERING AND MECHATRONICS	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Unit I: Introduction to Mechanics of Solid:** Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety. Basic Numerical problems. Types of beams under various loads, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment. Basic Numerical problems.	8
II	**Introduction to IC Engines and RAC:** **IC Engine:** Basic Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; Introduction to electric, and hybrid electric vehicles. **Refrigeration:** Its meaning and application, unit of refrigeration; Coefficient of performance, methods of refrigeration, construction and working of domestic refrigerator, concept of heat pump. Formula based numerical problems on cooling load. **Air-Conditioning:** Its meaning and application, humidity, dry bulb, wet bulb, and dew point temperatures, comfort conditions, construction and working of window air conditioner.	10
III	**Introduction to Fluid Mechanics and Applications:** **Introduction:** Introduction: Fluids properties, pressure, density, dynamic and kinematic viscosity, specific gravity, Newtonian and Non-Newtonian fluid, Pascal's Law, Continuity Equation, Bernaulli's Equation and its applications, Basic Numerical problems. Working principles of hydraulic turbines & pumps and their classifications, hydraulic accumulators, hydraulic lift and their applications.	7
IV	**Measurements and Control System:** Concept of Measurement, Error in measurements, Calibration, measurements of pressure, temperature, mass flow rate, strain, force and torques; Concept of accuracy, precision and resolution, Basic Numerical problems. System of Geometric Limit, Fit, Tolerance and gauges, Basic Numerical problems. **Control System Concepts:** Introduction to Control Systems, Elements of control system, Basic of open and closed loop control with example.	8
V	**Introduction to Mechatronics:** Evolution, Scope, Advantages and disadvantages of Mechatronics, Industrial applications of Mechatronics, Introduction to autotronics, bionics, and avionics and their applications. Sensors and Transducers: Types of sensors, types of transducers and their characteristics. **Overview of Mechanical Actuation System** – Kinematic Chains, Cam, Train Ratchet Mechanism, Gears and its type, Belt, Bearing, **Hydraulic and Pneumatic Actuation Systems:** Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems.	10

Reference Books:

1. Basic Mechanical Engineering, G Shanmugam, S Ravindran, McGraw Hill
2. Basic Mechanical Engineering, M P Poonia and S C Sharma, Khanna Publishers
3. Mechatronics : Principles, Concepts and Applications, Nitaigour Mahalik, McGraw Hill
4. Mechatronics, As per AICTE: Integrated Mechanical Electronic Systems, K.P. Ramachandran, G.K. Vijayaraghavan, M.S.Balasundaram, Wiley India
5. Mechanical Measurements & Control, Dr. D. S. Kumar. Metropolitan Book Company
6. Fluid Mechanics and Hydraulic Machines, Mahesh Kumar, Pearson India

The students will be able to		**Blooms Taxonomy**
CO1	Understand the concept of stress and strain, factor of safety, beams	K2
CO2	Understand the basic component and working of internal combustion engines, electric and hybrid vehicles, refrigerator and heat pump, air-conditioning.	K2
CO3	Understand fluid properties, conservation laws, hydraulic machinery used in real life.	K2
CO4	Understand the working principle of different measuring instrument with the knowledge of accuracy, error and calibration, limit, fit, tolerance and control system.	K2
CO5	Understand concept of mechatronics with their advantages, scope and Industrial application, the different types of mechanical actuation system, the different types of hydraulic and pneumatic systems.	K2
CO6	Apply concepts of strength of material for safe design, refrigeration for calculation of COP, concepts of fluid mechanics in real life, concepts of measurements in production systems.	K3

KCE-151P KCE-151P	ENGINEERING GRAPHICS AND DESIGN LAB	0L:1T:2P	1 Credits

Unit	Topics	Lectures
I	**Introduction to Engineering Drawing, Orthographic Projections:** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales –Plain and Diagonal Scales. Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes	8
II	**Projections and Sections of Regular Solids:** Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc. Prism, Cylinder, Pyramid, Cone–Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.	8
III	**Isometric Projections:** Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice- versa, Conversions.	8
IV	**Computer Graphics:** Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles: Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two- dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling.	8
V	**Demonstration of a simple team design project:** Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).	8

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, McGraw Publication
4. Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers. (Corresponding set of) CAD Software Theory and User Manuals**.**

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

1. Understanding of the visual aspects of engineering design
2. Understanding of engineering graphics standards and solid modelling
3. Effective communication through graphics
4. Applying modern engineering tools necessary for engineering practice
5. Appling computer-aided geometric design
6. Analysis of Isometric views
7. Creating working drawings

KWS-151P KWS-251P	MECHANICAL WORKSHOP LAB	0L:1T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

The students will be able to		Blooms Taxonomy
CO1	Use various engineering materials, tools, machines and measuring equipments.	K3
CO2	Perform machine operations in lathe and CNC machine.	K3
CO3	Perform manufacturing operations on components in fitting and carpentry shop.	K3
CO4	Perform operations in welding, moulding, casting and gas cutting.	K3
CO5	Fabricate a job by 3D printing manufacturing technique	K3

S. No.	Mechanical Workshop	Duration
1	**Introduction to Mechanical workshop material, tools and machines**	
	To study layout, safety measures and different engineering materials (mild steel, medium carbon steel, high carbon steel, high speed steel and cast iron etc) used in workshop.	3 Hours
	To study and use of different types of tools, equipments, devices & machines used in fitting, sheet metal and welding section.	
	To determine the least count of vernier caliper, vernier height gauge, micrometer (Screw gauge) and take different reading over given metallic pieces using these instruments.	
2	**Machine shop**	
	Demonstration of working, construction and accessories for Lathe machine	3 Hours
	Perform operations on Lathe - Facing, Plane Turning, step turning, taper turning, threading, knurling and parting.	
3	**Fitting shop**	
	1. Practice marking operations. 2. Preparation of U or V -Shape Male Female Work piece which contains: Filing, Sawing, Drilling, Grinding.	3 Hours
4	**Carpentry Shop**	
	Study of Carpentry Tools, Equipment and different joints.	
	Making of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint	3 Hours
5	**Welding Shop**	
	Introduction to BI standards and reading of welding drawings.	

	Practice of Making following operations Butt Joint Lap Joint TIG Welding MIG Welding	**6 Hours**
6	**Moulding and Casting Shop**	
	Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes Demo of mould preparation and Aluminum casting Practice – Study and Preparation of Plastic mould	**6 Hours**
7	**CNC Shop**	
	Study of main features and working parts of CNC machine and accessories that can be used. Perform different operations on metal components using any CNC machines	**6 Hours**
8	**To prepare a product using 3D printing**	**3 Hours**

Reference Books:

1. Workshop Practice, H S Bawa, McGraw Hill
2. Mechanical Workshop Practice, K C John, PHI
3. Workshop Practice Vol 1, and Vol 2, by HazraChoudhary , Media promoters and Publications
4. CNC Fundamentals and Programming, By P. M. Agrawal, V. J. Patel, Charotar Publication.

KAS- 154P KAS-254P	ENGLISH LAB	0L:1T:2P	1 Credit

Course Objectives:

1. To facilitate software based learning to provide the required English Language proficiency to students.
2. To acquaint students with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
3. To train students to use the correct and error-free writing by being well versed in rules of English grammar.
4. To cultivate relevant technical style of communication and presentation at their work place and also for academic uses.
5. To enable students to apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics.

SYLLABUS: PROFESSIONAL COMMUNICATION LAB SHALL HAVE TWO PARTS:

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (LP.A.)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistic /Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme Presentation/ Keynote Presentation based on correct methodologies argumentation
7. Individual Speech Delivery/Conferencing with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practical's on a model Audio

1. **Computer assisted software based Language Learning:** Software based self-guided learning to provide the required English language proficiency to students from an employability and career readiness standpoint. The software should align to Common European Framework of Reference for Languages (CEFR) and deliver a CEFR level – B2 upon completion.
2. **Interactive Communication Skills:** Students should practice the language with variety of activities and exercises based on employability skills as startup presentations, GD, Mock interview, Video portfolio, Extempore, Role play, Just A Minute (JAM) etc.

Suggested software:

- ***Oxford Achiever*** by Oxford University Press.
- ***Cambridge English Empower*** by Cambridge University Press.
- ***MePro.*** by Pearson India Education Services Pvt. Ltd.
- ***New Interactions*** by McGraw-Hill India.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. A Course in Phonetics and Spoken English, Sethi & Dhamija:, Prentice Hall
4. English Pronouncing Dictionary, Joans Daniel, Cambridge University Press, 2007.
5. English Grammar and Usage by R. P. Sinha, Oxford University Press, 2005, New Delhi.
6. English Grammar, Composition and Usage by N.K. Agrawal & F.T. Wood, Macmillan India Ltd., New Delhi.
7. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
8. English Grammar & Composition by Wren & Martin, S.Chand & Co. Ltd., New Delhi.
9. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
10. Personality Development, Harold R. Wallace & L. Ann Masters, Cengage Learning, New Delhi
11. Personality Development & Soft Skills, Barun K. Mitra, Oxford University Press, 2012 New Delhi.
12. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, McGraw Hill & Co. Ltd., 2001, New Delhi.
13. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
14. Spoken English- A Manual of Speech and Phonetics by R. K. Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
15. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

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

1. Students will be enabled to understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
2. Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
3. Students will apply it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.
4. Students will be made to evaluate the correct and error-free writing by being well-versed in rules of English grammar and cultivate relevant technical style of communication &presentation at their work place and also for academic uses.
5. Students will apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing interpersonal communication skills and positive attitude leading to their professional competence.

KCS-151P KCS-251P	PROGRAMMING FOR PROBLEM SOLVING	0L:1T:2P	1 Credit

KCS151P- Programming for Problem Solving Lab		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.	K_3, K_4
CO 2	Demonstrate an understanding of computer programming language concepts.	K_3, K_2
CO 3	Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.	K_6, K_4
CO 4	Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures.	K_1, K_5
CO 5	Develop confidence for self education and ability for life-long learning needed for Computer language.	K_3, K_4

Lab No.	Expt.	Program
LAB 1	**1**	Write a program to calculate the area of triangle using formula at=√s(s-a)(s-b)(s-c)
	2	Basic salary of an employee is input through the keyboard. The DA is 25% of the basic salary while the HRA is 15% of the basic salary. Provident Fund is deducted at the rate of 10% of the gross salary (BS+DA+HRA). Program to calculate the Net Salary.
	3	Write a program to determine the roots of quadratic equation.
	4	Write a program to find the largest of three numbers using nested if else.
	5	Write a program to receive marks of physics, chemistry & maths from user & check its eligibility for course if a) Marks of physics > 40 b) Marks of chemistry > 50 c) Marks of math's > 60 d) Total of physics & math's marks > 150 or e) Total of three subjects marks > 200
LAB 2	**6**	Write a program to find the value of y for a particular value of n. The a, x, b, n is input by user if n=1 y=ax%b if n=2 y=ax2+b2 if n=3 y=a-bx if n=4 y=a+x/b

	7	Write a program to construct a Fibonacci series upto n terms.
	8	Write a program to find whether the number is Armstrong number.
	9	Write a program to generate sum of series 1!+2!+3!+----------n!
	10	Write a program to find the sum of following series 1-X1/1!+X2/2!-……Xn/n!.
LAB 3	**11**	Write a program to print the entire prime no between 1 and 300.
	12	Write a program to print out all the Armstrong number between 100 and 500.
	13	Write a program to draw the following figure: 3 2 1 21 1 * ** ***
	14	Write a program to receive a five-digit no and display as like 24689: 2 4 6 8 9
LAB 4	**15**	Write a function that return sum of all the odd digits of a given positive no entered through keyboard.
	16	Write a program to print area of rectangle using function & return its value to main function.
	17	Write a program to calculate the factorial for given number using function.
	18	Write a program to find sum of Fibonacci series using function.
	19	Write factorial function & use the function to find the sum of series S=1!+2!+-----n!.
LAB 5	**20**	Write a program to find the factorial of given number using recursion.
	21	Write a program to find the sum of digits of a 5 digit number using recursion.
	22	Write a program to calculate the GCD of given numbers using recursion.
	23	Write a program to convert decimal number in to binary number.
	24	Write a program to convert binary number in to decimal number.
LAB 6	**25**	Write a program to delete duplicate element in a list of 10 elements & display it on screen.
	26	Write a program to merge two sorted array & no element is repeated during merging.
	27	Write a program to evaluate the addition of diagonal elements of two square matrixes.
	28	Write a program to find the transpose of a given matrix & check whether it is symmetric or not.
	29	Write a program to print the multiplication of two N*N (Square) matrix.
LAB 7	**30**	Write a program in C to check whether the given string is a palindrome or

		not.
	31	Write program to sort the array of character (String) in alphabetical order like STRING in GINRST.
	32	Write a program to remove all the blank space from the string & print it, also count the no of characters.
	33	Write a program to store the following string "zero", "one" -------"five". Print the no in words, given in figure as 3205.
LAB 8	**34**	Write a program to compare two given dates. To store a date uses a structure that contains three members namely day, month and year. If the dates are equal then display message equal otherwise unequal.
	35	Define a structure that can describe a hotel. It should have the member that includes the name, address, grade, room charge and number of rooms. Write a function to print out hotel of given grade in order of room charges.
	36	Define a structure called cricket with player name, team name, batting average, for 50 players & 5 teams. Print team wise list contains names of player with their batting average.
LAB 9	**37**	Write a c program to copy & count the character content of one file says a.txt to another file b.txt.
	38	Write a program to take 10 integers from file and write square of these integer in other file.
	39	Write a program to read number from file and then write all 'odd' number to file ODD.txt & all even to file EVEN.txt.
	40	Write a program to print all the prime number, between 1 to 100 in file prime.txt.
	41	Write the following C program using pointer: a) To sort the list of numbers through pointer b) To reverse the string through pointer.
LAB 10	**42**	Write a program to find the largest no among 20 integers array using dynamic memory allocation.
	43	Using Dynamic Memory Allocation, Write a program to find the transpose of given matrix.
	44	Write a program to find the factorial of given number using command line argument.
	45	Write a program to find the sum of digits of a 5 digit number using command line argument.

Note:

a) **The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner**

b) **It is also suggested that open source tools should be preferred to conduct the lab. Some open source online compiler to conduct the C lab are as follows:**

- **https://www.jdoodle.com/c-online-compiler/**
- **https://www.tutorialspoint.com/compile_c_online.php**
- **https://www.programiz.com/c-programming/online-compiler/**
- **https://www.hackerrank.com/**

KCS151P- Programming for Problem Solving Lab: Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Problem Solving Lab	Numerical Representation
	Beauty of Numbers
	More on Numbers
	Factorials
	String Operations
	Recursion
	Advanced Arithmatic
	Searching and Sorting
	Permutation
	Sequences

KEE-151P KEE-251P	ELECTRICAL ENGINEERING LAB	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

(A) Hardware based experiments

1. Verification of Kirchhoff's laws.
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit.
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer.
10. Determination of efficiency of a dc shunt motor by load test.
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single phase induction machine and synchronous machine.

(B) Experiments available on virtual lab

1. Kirchhoff's laws.
   Virtual lab link: http://vlab.amrita.edu/?sub=3&brch=75&sim=217&cnt=2
2. Thevenin Theorem.
   Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=313&cnt=1
3. RLC series resonance.
   Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1
4. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
   Virtual lab link: http://vp-dei.vlabs.ac.in/Dreamweaver/measurement.html
5. Determination of parameters of ac single phase series RLC circuit.
   Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=332&cnt=1
6. To observe the B-H loop of a ferromagnetic material in CRO.
   Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=282&sim=1507&cnt=2
7. Determination of the efficiency of a dc motor by loss summation method(Swinburne's test).
   Virtual lab link: http://em-iitr.vlabs.ac.in/exp5/index.php?section=Theory

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

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

KEC-151P KEC-251P	ELECTRONICS LAB	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

Part A

1. Study of various types of Active & Passive Components based on their ratings.
2. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
3. PCB Lab: a. Artwork & printing of a simple PCB. b. Etching & drilling of PCB
4. Winding shop: Step down transformer winding of less than 5VA.
5. Soldering shop: Soldering and disordering of Resistor in PCB. Soldering and disordering of IC in PCB. Soldering and disordering of Capacitor in PCB

Part B

1. Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. P-N Junction diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.
4. Characteristics of Zener diode: V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance.
5. Characteristic of BJT: BJT in CE configuration.
6. To study Operational Amplifier as Adder and Subtractor
7. Verification of Truth Table of Various Logic Gate.
8. Implementation of the given Boolean function using logic gates in both SOP and POS forms.

(C)

Part A	**PCB Lab**: a. Artwork & printing of a simple PCB. b. Etching & drilling of PCB	This practical is not possible by virtual lab. It will be conducted only in physical mode
Part B	Study of Lab Equipment's and Components: CRO, Multimeter, Function Generator, Power supply- Active, Passive Components and Bread Board.	NA, These test equipment can be Demonstrated on line from any lab of ECE department or physical mode is only option.

(D) Experiments available on virtual lab

P-N Junction on diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.	http://vlabs.iitkgp.ernet.in/be/exp5/index.html
Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.	http://vlabs.iitkgp.ernet.in/be/exp6/index.html http://vlabs.iitkgp.ernet.in/be/exp7/index.html
Characteristics of Zener diode: V-I characteristics of Zener diode, Graphical measurement of forward and reverse resistance.	http://vlabs.iitkgp.ernet.in/be/exp10/index.html
Characteristic of BJT: BJT in CE configuration.	http://vlabs.iitkgp.ernet.in/be/exp11/index.html
To study Operational Amplifier as Adder and Subtractor	http://vlabs.iitkgp.ernet.in/be/exp17/index.html http://vlabs.iitkgp.ernet.in/be/exp18/index.html
Verification of Truth Table of Various Logic Gate	https://de-iitr.vlabs.ac.in/digital-electronics-iitr/exp/truth-table-gates/
Implementation of the given Boolean function using logic gates in both SOP and POS forms.	https://de-iitr.vlabs.ac.in/digital-electronics-iitr/exp/realization-of-logic-functions/

KMC 101/201	ARTIFICAL INTELLIGENCE FOR ENGINEERS	2L:0T:0P	2 Credit

The students will be able to		Blooms Taxonomy
CO1	Understand the evolution and various approaches of AI	**K2**
CO2	Understand data storage, processing, visualization, and its use in regression, clustering etc.	**K2**
CO3	Understand natural language processing and chatbots	**K2**
CO4	Understand the concepts of neural networks	**K2**
CO5	Understand the concepts of face, object, speech recognition and robots	**K2**

Course	Topics
Unit 1	**An overview to AI**
1.1	The evolution of AI to the present
1.2	Various approaches to AI
1.3	What should all engineers know about AI?
1.4	Other emerging technologies
1.5	AI and ethical concerns
Unit 2	**Data & Algorithms**
2.1	History Of Data
2.2	Data Storage And Importance of Data and its Acquisition
2.3	The Stages of data processing
2.4	Data Visualization
2.5	Regression, Prediction & Classification
2.6	Clustering & Recommender Systems
Unit 3	**Natural Language Processing**
3.1	Speech recognition
3.2	Natural language understanding
3.3	Natural language generation
3.4	Chatbots
3.5	Machine Translation
Unit 4	**Artificial Neural Networks**
4.1	Deep Learning
4.2	Recurrent Neural Networks
4.3	Convolutional Neural Networks
4.4	The Universal Approximation Theorem
4.5	Generative Adversarial Networks
Unit 5	**Applications**
5.1	Image and face recognition
5.2	Object recognition
5.3	Speech Recognition besides Computer Vision
5.4	Robots
5.5	Applications

Reference Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig, Prentice Hall
2. Artificial Intelligence by Kevin Knight, Elaine Rich, Shivashankar B. Nair, Publisher : McGraw Hill
3. Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, Jian Pei, Publisher: Elsevier Science.
4. Speech & Language Processing by Dan Jurafsky, Publisher : Pearson Education
5. Neural Networks and Deep Learning A Textbook by Charu C. Aggarwal, Publisher: Springer International Publishing
6. Introduction to Artificial Intelligence By Rajendra Akerkar, Publisher : PHI Learning

KMC102/202	EMERGING TECHNOLOGY FOR ENGINEERING	2L:0T:0P	2 Credit

Course Objectives:

1. To understand the basic concepts of IoT, followed by major components, its layer architecture and how IoT is impacting the Industry in the various forms along with major applications.
2. To make students aware about basic concepts of cloud computing, its benefits and different applications along with insights of major service providers.
3. To understand the basic concepts of Blockchain and its underlying technologies with its implementation as cryptocurrencies.
4. To understand the concept of Additive Manufacturing, its applications in various fields and the basic concepts of drones, their assembly and government regulations involved.
5. To introduce students to the upcoming technology and to develop the required skills for practical applications.

The students will be able to		**Blooms Taxonomy**
CO1	Understand the concepts of internet of things, smart cities and industrial internet of things	**K2**
CO2	Understand the concepts of cloud computing	**K2**
CO3	Understand the concepts of block chain, cryptocurrencies, smart contracts	**K2**
CO4	Understand design principles, tools, trends in 3 D printing and drones	**K2**
CO5	Understand augmented reality (AR), virtual reality (VR), 5G technology, brain computer interface and human brain	**K2**

Course	**EMERGING TECHNOLOGY FOR ENGINEERING**
Unit 1	**Internet of Things**
1.1	What is the Internet of Things?
1.2	Sensors, their types and features
1.3	IoT components: layers
1.4	Smart Cities
1.5	Industrial Internet of Things
Unit 2	**Cloud Computing**
2.1	Cloud Computing : it's nature and benefits
2.2	AWS
2.3	Google
2.4	Microsoft
2.5	Vendor Offering - IBM
Unit 3	**Blockchain**
3.1	What is Blockchain? Fundamentals
3.2	Principles and Technologies
3.3	Cryptocurrencies
3.4	Smart Contracts
3.5	Blockchain Applications and use cases

Unit 4	Digital Manufacturing : 3D Printing & Drones
4.1	The history and survey of 3D Printing
4.2	Design Principles and Tools
4.3	Emerging Trends & Use Cases in 3D Printing
4.4	Introduction of Drones, Engineering Disciplines
4.5	Multirotor Drone Assembly Course /Regulations and procedures for becoming a drone pilot
Unit 5	**Future Trends**
5.1	Augmented Reality (AR) and Virtual Reality (VR)
5.2	History, objective & global scenario of 5G Telecom
5.3	5G in India, Application and Use Cases
5.4	Brain Computer Interface, Application, Modal and Global Market
5.5	Brain Computer Interface and Human Brain

References Books:

IoT:

1. Internet of Things(IoT): Systems and Applications: Mehmet R. Yuce, Jamil Y. Khan
2. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things: David Hanes, Patrick Grossetete, Gonzalo Salgueiro.
3. Designing the Internet of Things: McEwen, Adrian, Cassimally, Hakim.

Cloud Computing:

1. Mastering Cloud Computing: Foundations and Applications Programming Book by Christian Vecchiola, Rajkumar Buyya, and S. Thamarai Selvi
2. Cloud Computing – Concepts, Technology and Architecture Pearson Thomas Erl
3. Cloud Computing Master the Concepts, Architecture and Applications with Real-world examples and Case studies By Ruchi Doshi, Temitayo Fagbola, Mehul Mahrishi.

Blockchain:

1. Block Chain: Blueprint for a New Economy, O'Reilly, Melanie Swan
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps by: Daniel Drescher.

Digital Manufacturing:

1. Designing Reality: How to Survive and Thrive in the Third Digital Revolution by Prof. Niel Gershenfeld.
2. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing by Ian Gibson.
3. Build a Drone: A Step-by-Step Guide to Designing, Constructing, and Flying Your Very Own Drone by Barry Davies.

Future Trends:

1. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
2. Doug A Bowman, Ernest Kuijff, Joseph J La Viola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005.
3. Simon Haykin, "Communication Systems", 4th Edition, Wiley India

KNC-101	SOFT SKILLS-I	2L:0T:0P

SOFT SKILLS-I

UNIT I- Basics of Applied Grammar and usage

Tenses: Part of Speech, Active & Passive Voice, Articles, Subject-verb agreement, Antonyms, Synonyms, Prefix and Suffix, Narration, Conditional sentences, Concord, Tag questions, punctuation marks.

UNIT II- Presentation and Interaction Skills

Speech Delivery, Interjecting: Objectives& Methodology; Group Discussion: Objectives & Methods; Theme Presentation: Methods; Argumentative skills: Pattern and Ingredients; Debate & Discussion: Unity, Coherence & Emphasis. Public Speaking: Audience Analysis: Approach and Style. Interviews: Types; Focus & Objectives.

UNIT III- Interpersonal Communication Skills

Features: Methods; Principles; Requisites; Team- work; Skills: Empathy, Emotional Intelligence, empathy and listening skills. Time Management; Attitude; Responsibility. Leadership qualities: Integrity; Values; Trust; Self-Confidence & Courage; Communication and Networking; Speed reading; Problem Solving & Trouble- Shooting

UNIT IV- Persuasion and Negotiation Skills

Definition; Understanding Attitude, Beliefs, Values and Behavior; The process of Persuasion: Analysis of Audience; Classification of Audience; Egoistic and Non-Egoistic; Specific Techniques for Specific Audience; Skills of Persuasion, Steps to Persuasion/Influence, Negotiation: Definition; Process of Negotiation: Characteristics; Qualities of good negotiator; Approaches to Negotiation.

UNIT V- Communication Skills

Introduction to oral communication, Nuances & Modes of Speech Delivery, Public speaking: confidence, clarity, and fluency, Non verbal Communication: Kinesics, Paralinguistic features of Voice-Dynamics, Proxemics, Chronemics, and Presentation Strategies: planning, preparation, organization, delivery.

Course Outcome:

Unit 1- Students will be enabled to **understand** the correct usage of grammar.

Unit 2- Students will **apply** the fundamental inputs of communication skills in making speech delivery, individual conference, and group communication.

Unit 3-Students will **evaluate** the impact of interpersonal communication on their performance as a professional and in obtaining professional excellence at the workplace.

Unit 4-Skills and techniques of persuasion and negotiation would **enhance** the level of students at multifarious administrative and managerial platforms.

Unit 5-Student will be able to **equip** with basics of communication skills and will **apply** it for practical and oral purposes by being honed up in presentation skills and voice-dynamics.

Prescribed Books:

1. **Technical Communication, (Second Ed.); O.U.P.,** Meenakshi Raman & S.Sharma New Delhi, 2011
2. **Business Communication for Managers**, Payal Mehra, Pearson, Delhi, 2012.
3. **Personality Development,** Harold R. Wallace et. al, Cengage Learning India Pvt. Ltd; New Delhi 2006
4. **Practical Communication** by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
5. **Personality Development & Soft Skills,** Barun K.Mitra, Oxford University Press, New Delhi, 2012.
6. **Public Speaking,** William S. Pfeiffer, Pearson, Delhi, 2012.
7. **Human Values,** A.N. Tripathi, New Age International Pvt. Ltd. Publishers New Delhi ,2005

KNC-201	SOFT SKILLS-II	2L:0T:0P

SOFT SKILLS-II

UNIT I- LSRW Skills

Active Listening: Meaning and Art of Listening, Pronunciation, Tongue-Twisters, Stress in English Language, Reading style: Skimming; Scanning; Churning & Assimilation, Effective writing tools, Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc

UNIT II- Conversational& Social Skills

Definition of Conversation; Speech and Conversation: Distinction; Listening and Conversation; Sustaining Interest; Rules of Conversation; Conversation and Personality; Importance of Conversation: Competence Relationships; Social Skills: Role of Communication; Purposeful Socializing; Attributes: Effective Communication; Conflict Resolution;; Relationship Management; Respect; Improvement Techniques: Feedback; Goal Setting; Affording Resources; Adopting Interpersonal Skills; Importance.

UNIT III- Motivation Skills

Motivation: Definition; Sources of Motivation: Initiative; Willingness To Work; Eagerness to take on Work; Initiative; Learning Ability; Going Extra Miles; Learning And Analysis; Motivating Others: Techniques; One To One Correspondence; Understanding; Individual Motivation; Mobilizing Optimal Performance; Praise and Compliment; Goal Setting for Individual Employee; Individual Cultivation of Skills; Facilitating Active Involvement; Trust in the Working Hands.

UNIT IV- Work-Place Skills

Managing Stress; Techniques: Application of 4 A's; Avoid; Alter; Access; Adapt; Resilience: Flexibility in Thought and Behavior; Tolerance and Self-Belief; Team-Work and Communication; Compassion in Leadership; Communication Skills; Listening and Responding; Speaking Skills; Positive Thinking: Controlling Mind.

UNIT V- Creativity and Critical Thinking

Creativity: Definition; Characteristics of Creative Person: Fluency; Originality; Curiosity; Critical Thinking: Definition; Abilities: Discerning Facts and Claims; Credibility Analysis; Identifying Valid Reasons; Distinguishing Relevant from Irrelevant Fact/Claims; Detecting Bias; Knowing the Hidden Motives; Creative Methods; Features.

Course Outcome:

Unit 1- Students will be able to **converse** well with effective LSRW skills in English.
Unit 2- Students will **evaluate** the importance of conversation in their personal and professional domain and **apply** it for extending their professional frontiers.
Unit 3- Students will learn to **apply** motivation skills for their individual and professional excellence.
Unit 4- Students will **utilize** their teamwork and their interpersonal communication skills to survive and excel at their work-place.
Unit 5-Students will learn to **evaluate** creativity for their professional innovation and critical thinking for their competence.

Prescribed Books:

1. **Technical Communication, (Second Ed.); O.U.P.,** Meenakshi Raman &S.Sharma New Delhi, 2011
2. **Personality Development,** Harold R. Wallace et. al, Cengage Learning India Pvt. Ltd; New Delhi 2006
3. **Personality Development & Soft Skills,** Barun K. Mitra, Oxford University Press, New Delhi, 2012.
4. **Practical Communication** by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
5. **Developing Communication Skills:** by Krishna Mohan, Meera Banerji; McMillan India Ltd, Delhi,1990.
6. **Communication Skills for Engineers and Scientists:** Sangeeta Sharma et. al., THI Learning Pvt Ltd, New Delhi, 2011.
7. **Public Speaking,** William S. Pfeiffer, Pearson, Delhi, 2012.
8. **Human Values,** A.N. Tripathi, New Age International Pvt. Ltd. Publishers New Delhi ,2005.

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March

*2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.*1 *This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)*

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.2

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

2Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one"s relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT (BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do"s and dont"s, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT (BHU) are noteworthy and one can learn from them.3

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective Depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director"s Address
03:00 pm - 05:00 pm	Interaction with Parents
03:30 pm - 05:00 pm	Mentor-Mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods within the Induction Program. We first show a typical daily timetable.

Day 3 onwards 06:00 am		**Activity** Wake up call	**Rema**
1.	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
2.	07:15 am - 08:55 am	Bath, Breakfast, etc.	
3.	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups
4.	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	
5.	01:00 pm - 02:25 pm	Lunch	
6.	02:30 pm - 03:55 pm	Afternoon Session See below.	
7.	04:00 pm - 05:00 pm	Afternoon Session See below.	
8.	05:00 pm - 05:25 pm	Break / light tea	
9.	05:30 pm - 06:45 pm	Games / Special Lectures	
10.	06:50 pm - 08:25 pm	Rest and Dinner	
11.	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.4 Follow Up after Closure: A question comes up as to what would be the follow up program after the formal

3-week Induction Program is over? The groups which are formed should function

as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor"s home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.

It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summaries

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Program is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Values component, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationship with their families and extended family in the college (with hostel staff and others). It also connects students with each other and with teachers so that they can share any difficulty they might be facing and seek help.

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

EVALUATION SCHEME & SYLLABUS

FOR

REVISED OPEN ELECTIVES I
(VII SEMESTER)

[Effective from the Session: 2020-21]

B.TECH.
VII SEMESTER 2020-21

REVISED OPEN ELECTIVE-I

1.	ROE070	HUMAN VALUES IN SANKHAY YOGA AND VEDANTA DARSAN
2.	ROE071	MODELLING AND SIMULATION OF DYNAMIC SYSTEMS
3.	ROE072	INTRODUCTION TO SMART GRID
4.	ROE073	CLOUD COMPUTING
5.	ROE074	UNDERSTANDING THE HUMAN BEING COMPREHENSIVELY - HUMAN ASPIRATIONS AND ITS FULFILLMENT
6.	ROE075	AUTOMATION AND ROBOTICS
7.	ROE076	COMPUTERIZED PROCESS CONTROL
8.	ROE077	MODELING OF FIELD-EFFECT NANO DEVICES
9.	ROE078	QUALITY MANAGEMENT
10.	ROE079	GIS & REMOTE SENSING
11.	ROE080	HUMAN VALUES IN BUDDHA AND JAIN DARSHAN

ROE 070	**Human Values in Sankhya, Yoga and Vedanta Darshan**	**L** 3	**T** 0	**P** 0	**C** 3
Version No.:	2.0 (updated as on June 12 '19)				
Prerequisite:	KVE 301/401- Universal Human Values and Professional Ethics				

Objectives:

1. To help students understand the basic principles of Sankhya, Yoga and Vedanta Darshan
2. To help students understand the existential realities including the human existence through Sankhya, Yoga and Vedanta Darshan
3. To help them to see the participation of human beings in the nature/ existential realities (i.e. human values) and therefore the human conduct through each one of them
4. To help students apply this understanding to make their living better at different levels- individual, family, society and nature
5. To facilitate the students in applying this understanding in their profession and lead an ethical life

Course Outcome: On completion of this course, the students will be able to

1. Understand the basic concepts of Sankhya, Yoga and Vedanta Darshan.
2. Understand the human being, the needs and activities of human being through Sankhya Yoga and Vedanta Darshan.
3. Understand the whole existence
4. Understand the role of human being in the entire existence, thus getting clarity about values at all levels of living and human conduct
5. Understand the foundation of human society and human tradition.

Catalogue Description: Sankhya, Yoga and Vedanta Darshan form a part of the philosophy of Indian tradition. This course outlines the basic concepts and principles of these three philosophies and provides scope for further reading of the philosophies, so as to gain clarity about the human being, the existence and human participation i.e. human values expressing itself in human conduct.

It is to be kept in mind that Darshan means realisation which calls for developing the capacity to see the reality in oneself directly. So, any study of Darshan shall help develop this capacity in the students through proper steps of practices and shall not just provide the information.

Module I :Introduction to Sankhya, Yoga and Vedanta Darshan and their Basics

Need to study Sankhya, Yoga and Vedanta Darshan; the origin of the three philosophies their basic principles and scope for further reading.

Module II: Sankhya Darshan

Sankhya Darshan- the *nature* of *Purush* and *Prakriti*, 8 types of *prakriti (pradhan, mahattatva, ahankar and* five *tanmatras*- sound, touch, form, taste and smell) and their 16 evolutes (*vicar); pramana (pratyaksha, anumana and agama),* bondage and salvation (liberation), the principle of *satkaryavad*, sense organs, work organs, *trigunatmak prakriti*

Module III: YogaDarshan

Yoga Darshan- the steps of *Ashtanga yoga (yama, niyama,aasana, pranayama, pratyahara, dharana, dhyan* and *samadhi*) and the challenges in following them, afflictions (*klesha)- avidya, asmita, raga, dvesha, abhinivesh,* different types of *vritti (pramana, viparyaya, vikalp, nidra, smriti),* the process of *nirodha* of *vritti*; *maitri, karuna, mudita, upeksha,* description of *yama, niyama, aasana* and *pranayaama; kriyayoga –tapa, swadhyaya* and *ishwar-pranidhana,* different steps of *samadhi,* different types of *sanyama, vivekakhyati, pragya.*

Module IV :Vedanta Darshan

Vedanta Darshan- *Nature* of *Brahma* and *Prakriti*, Methods of *Upasana*; a*dhyasa* and s*anskar*; n*ature* of Atma, description of existence, principle of *karma-phala*, description of *pancha kosha*, different *nature* of *paramatma/brahma, Ishwar, Four qualifications (Sadhan-chatushtay)*.

Module V : Purpose and Program for a Human Being based on the Three Darshan

The purpose and program of a human being living on the basis of the three darshanas, clarity and practice of human values and human conduct, the natural outcome of such a program on society, nature and tradition. possibility of finding solutions to present day problems in the light of it.

Text Books:

1. Chattejee, S.G. and Datta, D.M., "*An Introduction to Indian Philosophy*", University of Calcutta Press, 1960.

References:

1. Goendaka, J., "*Shreemad Bhagwat Geeta*", Geeta Press, Gorakhpur, 73rd reprint, 2015.
2. Krishna, I., "*The Sankhya Karika*", Bharatiya Vidya Prakashan, 4th edition, 2010.
3. Madhavacharya, "*Sarva-darshan Samgraha*", Chaukhambha Vidya Bhavan, Varanasi, 1984.
4. Maharaj, O. "*Patanjal Yog Pradeep*", Geeta press, Gorakhpur, 30th reprint, 2009.
5. Muller, F.M. "*The Six Systems of Indian Philosophy"*, Longmans Green and Co. Publication, London, 1928.
6. Radhakrishnan, S., "*Indian Philosophy* (*Volume* 1 and 2)", Oxford University Press, 2nd edition, 1996.
7. Shankaracharya, "*Vivek Choodamani",* Geeta Press, Gorakhpur, 48th Reprint, 2018.
8. Sivananda, S., "*Raj Yoga*", The Divine Life Society, Rishikesh, 7th edition, 2016.
9. Vachaspati, M., "*Sankhya Tatva Kaumudi*", Motilal Banarasi Das Publication Varanasi, 1921.

Mode of Evaluation:

Assignment/ Seminar/Continuous Assessment Test/Semester End Exam

ROE-071 MODELLING AND SIMULATION OF DYNAMIC SYSTEMS

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. Define, describe and apply basic concepts related to modeling and simulation.
2. Use conservation laws and constitutive relationships and other physical relations to model mechanical, electrical and flow systems, and combinations of these.

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

CO1: Define, describe and apply basic concepts related to modeling and simulation.

CO2: Construct bond graphs for the type of systems mentioned above, simplify and analyze the bond graph according to causality conflicts.

CO3: Use conservation laws and constitutive relationships and other physical relations to model mechanical, electrical and flow systems.

CO4: Find dynamic response and transfer function using various tools for system modeling.

CO5: Model and simulate mechanical and electrical systems using the computer tools Simulink.

ROE-071 MODELLING AND SIMULATION OF DYNAMIC SYSTEMS		
Unit	**Topic**	**Lectures**
1	**Introduction to modeling and simulation:** Introduction to modeling, Examples of models, modeling of dynamic system, Introduction to simulation, MATLAB as a simulation tool, Bond graph modeling, causality, generation of system equations.	**8**
2	**Bond graph modeling of dynamic system:** Methods of drawing bond graph model- Mechanical systems & Electrical systems, some basic system models- Mechanical systems, Thermal systems, hydraulic systems, pneumatic systems and electrical systems.	**8**
3	**System models of combined systems:** Linearity and non linearity in systems combined rotary and translatory system, electro mechanical system, hydro-mechanical system.	**8**
4	**Dynamic Response and System Transfer Function:** Dynamic response of 1^{st} order system and 2^{nd} order system, performance measures for 2^{nd} order system, system transfer function, transfer function of 1^{st} and 2^{nd} order system Block diagram algebra, signal flow diagram, state variable formulation, frequency response and bode plots.	**8**
5	**Simulation and simulation applications:** Simulation using SIMULINK, examples of simulation problems- simple and the compound pendulum, planner mechanisms, validation and verification of the simulation model, parameter estimation methods, system identifications, introduction to optimization.	**8**

Text Books and References:

1. Zeigler B.P. Praehofer. H. and Kim I.G. "Theory of modeling and simulation", 2nd Edition. Academic press 2000.
2. Robert L. Woods, Kent L. Lawrence, “Modeling and simulation of dynamic systems”, Person, 1997.
3. Brown, Forbes T. “Engineering System Dynamics”, New York, NY: CRC, 2001. ISBN: 9780824706166.
4. Pratab.R " Getting started with MATLAB" Oxford university Press 2009.

ROE-072 INTRODUCTION TO SMART GRID

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. Present the fundamental concepts associated with Smart Grids.
2. Review renewable energy generation, grid integration energy storage technologies and future developments
3. Introduce advanced management and control concepts of Smart Grids.

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

CO1: Identify the key elements of Smart Grids and visualize the roadmap towards next-Gen electricity networks.

CO2: Evaluate technology options pertaining to renewable energy generation, energy storage, data handling and communications for Smart Grids.

CO3: Justify technological and economical choices in the context of existing commercial Smart Grids projects.

CO4: Determine the relevance of Smart Grids projects, develop ways to evaluate their impacts and implications.

CO5: Analyse the new roles of utilities and consumers in Smart Grids.

ROE-072 INTRODUCTION TO SMART GRID		
Unit	**Topic**	**Lectures**
1	**Introduction: Introduction to Smart Grid:** Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.	8
2	**Smart Grid Technologies:** Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS), Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation.	8
3	**Smart Grid Technologies:** Smart Substations, Substation Automation, Feeder Automation, Geographic Information System (GIS), Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU), PMUs application to monitoring & control of power system.	8
4	**Microgrids and Distributed Energy Resources:** Concept of microgrid, need & application of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid, Plastic & Organic solar cells, thin flim solar cells, Variable speed wind generators, fuel cells, microturbines, Captive power plants, Integration of renewable energy sources.	8
5	**Power Quality Management in Smart Grid**: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring.	8

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai, "Integration of Green and Renewable Energy in Electric Power Systems", Wiley.
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press.
3. Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley.
4. Jean Claude Sabonnadiere, NouredineHadjsaid, "Smart Grids", Wiley Blackwell 19.
5. Stuart Borlase, "Smart Grids (Power Engineering)", CRC Press.

Reference Books:

1. Andres Carvallo, John Cooper, "The Advanced Smart Grid: Edge Power Driving Sustainability", Artech House Publishers July 2011.
2. James Northcote, Green, Robert G. Wilson "Control and Automation of Electric Power Distribution Systems (Power Engineering)", CRC Press.
3. MladenKezunovic, Mark G. Adamiak, Alexander P. Apostolov, Jeffrey George Gilbert "Substation Automation (Power Electronice and Power Systems)", Springer.
4. R.C. Dugan, Mark F. McGranghan, Surya Santoso, H. Wayne Beaty, "Electrical Power System Quality", 2nd Edition, McGraw Hill Publication.
5. Phadke, A.G., Thorp, J.S., "Synchronized Phasor Measurements and Their Applications", Springer.
6. James Momoh, "Smart Grid: Fundamentals of Design and Analysis", Wiley.

ROE-073 CLOUD COMPUTING

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. Provide students with the fundamentals and essentials of Cloud Computing..
2. Provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.

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

CO1: Articulate the main concepts, key technologies, strengths and limitations of cloud computing.

CO2: Learn the key and enabling technologies that help in the development of cloud.

CO3: Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models..

CO4: Explain the core issues of cloud computing such as resource management and security.

CO5: To appreciate the emergence of cloud as the next generation computing paradigm.

ROE-073 CLOUD COMPUTING		
Unit	**Topic**	**Lectures**
1	**Introduction :** Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.	**8**
2	**Cloud Enabling Technologies:** Service Oriented Architecture – REST and Systems of Systems – Web Services Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms–Virtualization of CPU–Memory–I/O Devices–Virtualization Support and Disaster Recovery.	**8**
3	**Cloud Architecture, Services And Storage:** Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage- as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.	**8**
4	**Resource Management And Security In Cloud:** Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a- Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.	**8**
5	**Cloud Technologies And Advancements:** Hadoop – Map Reduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.	**8**

Text and Reference Books:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

ROE- 074 Understanding the Human Being Comprehensively–Human Aspirations and its Fulfillment

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. To help the students having the clarity about human aspirations, goal, activities and purpose of life.
2. To facilitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence.
3. To help the students to develop the understanding of human tradition and its various components.

COURSE METHODOLOGY:

1. The methodology of this course is explorational 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.

ROE- 074 Understanding the Human Being Comprehensively–Human Aspirations and its Fulfillment		
Unit	**Topic**	**Lectures**
1	**Introduction:** The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.	8
2	**Understanding Human being and its expansion:** The domain of right understanding starts from understanding the human being (the knower, the experiencer and the doer); and extends up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).	8
3	**Activities of the Self:** Understanding the human being comprehensively is the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Reasons for harmony/contradiction in the self.	8

4	**Understanding Co-existence with other orders:** The need and the process of inner evolution (through self-exploration, self- awareness and self-evaluation)- particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence)	8
5	**Expansion of harmony from self to entire existence:** Understanding different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavour viz., realization, thought, behaviour and work (participation in the larger order) leading to harmony at all levels from self to Nature and entire Existence..	8

Reference Books:

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Sangal, G. P. Bagaria (2010), Excel Books, New Delhi [ISBN 978-8-174-46781-2]
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
3. Economy of Permanence – (a quest for social order based on non-violence), J.C.Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India
4. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA
5. IshandiNauUpnishad, Shankaracharya, Geeta press, Gorakhpur,
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
8. MahasatipatthanSutta , S N Goenka, Vipassana Research Institute, First Edition, 1996
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. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R. Gaur (1990), Commonwealth Publishers, New Delhi
12. Sanchian Sri Guru Granth Sahib Ji ,Shiromani Gurdwara Parbhandhak Committee, 2001
13. SamanSuttam, JinendraVarni ,1974.
14. Vyavaharvadi Samajshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
15. Vyavahatmak Janvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India.

ROE-075 AUTOMATION AND ROBOTICS

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. Acquire the knowledge on advanced algebraic tools for the description of motion.
2. Develop the ability to analyze and design the motion for articulated systems.
3. Develop an ability to use software tools for analysis and design of robotic systems

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

CO1: Use matrix algebra and Lie algebra for computing the kinematics of robot.

CO2: Calculate the forward kinematics and inverse kinematics of serial and parallel robots.

CO3: Calculate the Jacobian for serial and parallel robot.

CO4: Do the path planning for a robotic system.

CO5: Be proficient in the use of Maple or Matlab for the simulation of robots.

ROE-075 AUTOMATION AND ROBOTICS		
Unit	**Topic**	**Lectures**
1	**Automation:** Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation. Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.	**8**
2	**Manufacturing Automation:** Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimode and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.	**8**
3	**Robotics:** Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source. Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.	**8**
4	**Robot Drives and Power Transmission Systems:** Robot drive mechanisms: Hydraulic/Electric/Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear to Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings. Robot end Effectors: Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for	**8**

	grippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.	
5	**Robot Simulation:** Methods of robot programming, Simulation concept, Off-line programming, advantages of offline programming. Robot Applications: Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation. Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference.	**8**

Text Books and References:

1. An Introduction to Robot Technology, by CoifetChirroza, Kogan Page.
2. Robotics for Engineers, by Y. Koren, McGraw Hill.
3. Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.
4. Introduction to Industrial Robotics, by Nagrajan, Pearson India.
5. Robotics, by J.J. Craig, Addison-Wesley.
6. Industrial Robots, by Groover, McGraw Hill.
7. Robotic Engineering - An Integrated Approach : Richard D. Klafter Thomas A.
8. Robots & Manufacturing Automation, by Asfahl, Wiley.

ROE-076 COMPUTERIZED PROCESS CONTROL

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. Understand Basics of Computer-Aided Process Control.
2. Analyse Industrial communication System.
3. Design Process Modelling for computerized Process control.
4. Design Advanced Strategies For Computerised Process control.
5. Analyse Computerized Process Control.

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

CO1: Understand the Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer.

CO2: Design Phase Locked Local Loop, Mixers. Time Division Multiplexed System – TDM/PAM system.

CO3: Realize Process model, Physical model, Control Model. Modelling Procedure.

CO4: Formulate of Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.

CO5: Design Electric Oven Temperature Control, Reheat Furnace Temperature control.

ROE-076 COMPUTERIZED PROCESS CONTROL		
Unit	**Topic**	**Lectures**
1	Basics of Computer-Aided Process Control: Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer –Aided Process Control System Computer Aided Process–control Architecture: Centralized Control Systems, Distributed control Systems, Hierarchical Computer control Systems. Economics of Computer-Aided Process control. Benefits of using Computers in a Process control. Process related Interfaces: Analog Interfaces, Digital Interfaces, Pulse Interfaces, Standard Interfaces.	**8**
2	Industrial communication System: Communication Networking, Industrial communication Systems, Data Transfer Techniques, Computer Aided Process control software, Types of Computer control Process Software, Real Time Operating System	**8**
3	Process Modelling for computerized Process control: Process model, Physical model, Control Model, Process modelling. Modelling Procedure: Goals Definition, Information Preparation, Model Formulation, Solution Finding, Results Analysis, Model Validation	**8**
4	Advanced Strategies For Computerised Process control: Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.	**8**

5	Examples of Computerized Process Control: Electric Oven Temperature Control, Reheat Furnace Temperature control, Thickness and Flatness control System for metal Rolling, Computer-Aided control of Electric Power Generation Plant.	**8**

Text Books:

1. S. K. Singh, "Computer Aided Process control", PHI.

Reference Books:

1. C. L. Smith, "Digital computer Process Control", Ident Educational Publishers.
2. C. D. Johnson, "Process Control Instrumentation Technology", PHI.
3. Krishan Kant, "Computer Based Industrial Control"
4. Pradeep B. Deshpande & Raymond H. Ash, "Element of Computer Process Control with Advance Control Applications", Instrument Society of America, 1981.
5. C. M. Houpis & G. B. Lamond, "Digital Control System Theory", Tata McGraw Hill.

ROE-077 MODELING OF FIELD-EFFECT NANO DEVICES

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

3. Introduce novel MOSFET devices and understand the advantages of multi-gate devices.
4. Introduce the concepts of nanoscale MOS transistor and their performance characteristics.
5. Study the various nano-scaled MOS transistor circuits.

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

CO1: Study the MOS devices used below 10nm and beyond with an eye on the future.
CO2: Understand and study the physics behind the operation of multi-gate systems.
CO3: Design circuits using nano-scaled MOS transistors with the physical insight of their functional characteristics.
CO4: Understand and study the physics behind the Radiation effects in SOI MOSFETs.
CO5: Understand the impact of device performance on digital circuits.

ROE-077 MODELING OF FIELD-EFFECT NANO DEVICES		
Unit	**Topic**	**Lectures**
1	MOSFET scaling, short channel effects - channel engineering - source/drain engineering - high k dielectric - copper interconnects - strain engineering, SOI MOSFET, multigate transistors – single gate – double gate – triple gate – surround gate, quantum effects – volume inversion – mobility – threshold voltage – inter subband scattering, multigate technology – mobility – gate stack	**8**
2	MOS Electrostatics – 1D – 2D MOS Electrostatics, MOSFET Current-Voltage Characteristics – CMOS Technology – Ultimate limits, double gate MOS system – gate voltage effect - semiconductor thickness effect – asymmetry effect – oxide thickness effect – electron tunnel current – two dimensional confinement, scattering – mobility	**8**
3	Silicon nanowire MOSFETs – Evaluvation of I-V characteristics – The I-V characteristics for nondegenerate carrier statistics – The I-V characteristics for degenerate carrier statistics – Carbon nanotube – Band structure of carbon nanotube – Band structure of graphene – Physical structure of nanotube – Band structure of nanotube – Carbon nanotube FETs – Carbon nanotube MOSFETs – Schottky barrier carbon nanotube FETs – Electronic conduction in molecules – General model for ballistic nano transistors – MOSFETs with 0D, 1D, and 2D channels – Molecular transistors – Single electron charging – Single electron transistors.	**8**

4	Radiation effects in SOI MOSFETs, total ionizing dose effects – single-gate SOI – multi-gate devices, single event effect, scaling effects	**8**
5	Digital circuits – impact of device performance on digital circuits – leakage performance trade off – multi VT devices and circuits – SRAM design, analog circuit design – transconductance - intrinsic gain – flicker noise – self heating –band gap voltage reference – operational amplifier – comparator designs, mixed signal – successive approximation DAC, RF circuits.	**8**

Text and Reference Books:

1. J P Colinge, "FINFETs and other multi-gate transistors", Springer – Series on integrated circuits and systems, 2008
2. Mark Lundstrom, Jing Guo, "Nanoscale Transistors: Device Physics, Modeling and Simulation", Springer, 2006
3. M S Lundstorm, "Fundamentals of Carrier Transport", 2nd Ed., Cambridge University Press, Cambridge UK, 2000.

ROE-078 QUALITY MANAGEMENT

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. Introduce the importance of quality in improving competitiveness.
2. Understand the Implication of Quality on Business.
3. Implement Quality Implementation Programs.
4. Have exposure to challenges in Quality Improvement Programs.

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

CO1: Realize the importance of significance of quality.
CO2: Manage quality improvement teams.
CO3: Identify requirements of quality improvement programs.
CO4: Identify improvement areas based on cost of poor quality.
CO5: Organize for quality and development of quality culture through small group activities.

ROE-078 QUALITY MANAGEMENT		
Unit	**Topic**	**Lectures**
1	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.	**8**
2	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.	**8**
3	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.	**8**
4	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.	**8**
5	ISO-9000 and its concept of Quality Management, ISO 9000 series, Taguchi method, JIT in some details.	**8**

Text and Reference Books:

1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.

Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992

ROE-079 GIS & REMOTE SENSING

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. Understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

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

CO1: Understand about the principles of Remote Sensing and its advantages and limitations.
CO2: Retrieve the information content of remotely sensed data.
CO3: Apply problem specific remote sensing data for engineering applications.
CO4: Analyze spatial and attribute data for solving spatial problems.
CO5: Create GIS and cartographic outputs for presentation

ROE-079 GIS & REMOTE SENSING		
Unit	**Topic**	**Lectures**
1	Basic component of remote sensing (RS), advantages and limitations of RS, possible use of RS techniques in assessment and monitoring of land and water resources; electromagnetic spectrum, energy interactions in the atmosphere and with the Earth's surface; major atmospheric windows; principal applications of different wavelength regions; typical spectral reflectance curve for vegetation, soil and water, spectral signatures.	**8**
2	Different types of sensors and platforms; contrast ratio and possible causes of low contrast; aerial photography; types of aerial photographs, scale of aerial photographs, planning aerial photography- end lap and side lap; stereoscopic vision, requirements of stereoscopic photographs; air-photo interpretation- interpretation elements;	**8**
3	photogrammetry- measurements on a single vertical aerial photograph, measurements on a stereo-pair- vertical measurements by the parallax method; ground control for aerial photography; satellite remote sensing, multispectral scanner- whiskbroom and push-broom scanner; different types of resolutions; analysis of digital data- image restoration; image enhancement; information extraction, image classification, unsupervised classification, supervised classification, important consideration in the identification of training areas, vegetation indices.	**8**
4	Microwave remote sensing. GI Sand basic components, different sources of spatial data, basic spatial entities, major components of spatial data, Basic classes of map projections and their properties. .	**8**
5	Methods of data input into GIS, Data editing, spatial data models and structures, Attribute data management, integrating data (map overlay) in GIS, Application of remote sensing and GIS for the management of land and water resources.	**8**

Text & Reference Books:

1. Reddy Anji, M. 2006. Textbook of Remote Sensing and Geographical Information Systems. BS Publications, Hyderabad.
2. Elangovan, K. 2006. GIS Fundamentals Applications and Implementations. New India Publication Agency, New Delhi.
3. George Joseph. 2005. Fundamentals of Remote Sensing. 2nd Edition. Universities Press (India) Private Limited, Hyderabad.
4. Jensen, J.R. 2013. Remote Sensing of the Environment: An Earth Resource Perspective. Pearson Education Limited, UK.
5. Lillesand, T., R.W. Kiefer and J. Chipman. 2015. Remote Sensing and Image Interpretation. 7th Edition, John Wiley and Sons Singapore Pvt. Ltd., Singapore.
6. Sabins, F.F. 2007. Remote Sensing: Principles and Interpretation. Third Edition, Waveland Press Inc., Illinois, USA.

ROE 080	**Human Values in Bauddha and Jain Darshan**	**L** 3	**T** 0	**P** 0	**C** 3
Version No.:	2.0 (updated as on June 12th 2019)				
Prerequisite:	RVE 301/401- Universal Human Values and Professional Ethics Desirable- 10 Day Vipassana Meditation course by Shri S. N. Goenka				

Objectives:

1. To help students understand the basic principles of Bauddha and Jain Darshan
2. To help students understand the existential realities including the human existence through Bauddha and Jain Darshan
3. To help them to see the participation of human beings in the nature/ existential realities (i.e. human values) and therefore the human conduct through each one of them
4. To help students apply this understanding to make their living better at different levels- individual, family, society and nature
5. To facilitate the students in applying this understanding in their profession and lead an ethical life.

Course Outcome: On completion of this course, the students will be able to

1. Understand the basic concepts of Bauddha and Jain Darshan
2. Understand the human being, the needs and activities of human being through Bauddha and Jain Darshan
3. Understand the whole existence
4. Understand the role of human being in the entire existence, thus getting clarity about values at all levels of living and human conduct
5. Understand the foundation of human society and human tradition.

Catalogue Description: Bauddha and Jain Darshan form a part of the philosophy of Indian tradition. This course outlines the basic concepts and principles of these two philosophies and provides scope for further reading of the philosophies, so as to gain clarity about the human being, the existence and human participation i.e. human values expressing itself in human conduct.

It is to be kept in mind that Darshan means realisation which calls for developing the capacity to see the reality in oneself directly. So, any study of Darshan shall help develop this capacity in the students through proper steps of practices and shall not just provide the information.

Module I: Introduction to Bauddha and Jain Darshan and their Basics

Need to study Bauddha and Jain Darshan; the origin of the thsee philosophies, their basic principles and scope for further reading.

Module II: Basic Principles of Bauddha Darshan

law of impermanence (changability); four noble truths; eightfold path; law of cause- action (*pratitya-samutpaad*)

Definition of some salient words of Buddha Darshan – *nirvana, dhamma, tri- ratna(Buddha, Dharma and Sangh), pragya, karma, parmi, ashta-kalap, trishna, shad-ayatan, samvedana, vipassana, anitya, maitri, brham-vihaar, tathagata, arahant.*

Module III: Purpose and Program for a Human Being based on Bauddha Darshan

The purpose and program of a human being living on the basis of it, clarity and practice of human values and human conduct, the natural outcome of such a program on society, nature and tradition.

Purpose-freedom from suffering, *nirvana*; root of suffering- *vikaar – raga, dvesha* and *moha,* Progam – various steps of meditation for attaining knowledge; *shamath and vipassana; sheel-samadhi-pragya; practice of equanimity (samatva),* eightfold path(Ashtang Marg); combination of understanding and practice.

Module IV: Basic Principles of Jain Darshan

Basic realities – description of nine elements in existence (*jeev, ajeev, bandh, punya, paap, aashrav, samvar, nirjara, moksha*), 6 dravya of lok – *dharma, adhrma, akash, kaal, pudgal, jeev*; tri-lakshan, various types of *pragya*, various stages of realisation; *samyak-gyan, samyak-darshan, samyak-charitra, syadvaad, anekantavaad, naya- nishchaya and vyavahar, karma-phal siddhanta*

Definition of some salient words of Jain Darshan *–arhant, jin, tirthankara, panch-parameshthi, atma, pramaan, kaal, pudgal, paramanu, kashay, leshya.*

Module V: Purpose and Program for a Human Being based on Jain Darshan

The purpose and program of a human being living on the basis of it, clarity and practice of human values and human conduct, the natural outcome of such a program on society, nature and tradition, possibility of finding solutions to present day problems in the light of it.

Purpose (goal) - *moksha*, Program- following *mahavrat, anuvrat, 10 lakshan dharma; samyak darshan-gyan-charitra*. Commonality with Bauddha Darshan

Text Books:

1. Chattejee, S.G. and Datta, D.M., "*An Introduction to Indian Philosophy*", University of Calcutta Press, 1960.

References:

1. "*Dhammapad*", Vipassana Research Institute, 2001.
2. Drukpa, G., "*Musings from the Heart"*, Drukpa Publications Private Ltd, 2018.
3. Jyot, *"Ek cheez milegi Wonderful"*, A Film Directed by Jyot Foundation, 2013.
4. Goenka, S.N., "The Discourse Summaries", Vipassana Research Institute, 1987.
5. Madhavacharya, "*Sarva-darshan Samgraha"*, Chaukhambha Vidya Bhavan, Varanasi, 1984.
6. Varni, J., "*Samansuttam"*, Sarva Seva Sangh Prakashan, Varanasi, 7th Edition, 2010.
7. https://www.youtube.com/watch?v=cz7QHNvNFfA&list=PLPJVlVRVmhc4Z01fD57jbzycm9I6W054x (English)
8. https://www.youtube.com/watch?v=r5bud1ybBDc&list=PLY9hraHvoLQLCkl7Z2DWKMgRAWU77bKFy (Hindi)

Mode of Evaluation: Assignment/ Seminar/Continuous Assessment Test/Semester End Exam

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

Open Electives II

For
VIII Semester

Bachelor of Technology
(Choice Based Credit System)

2020-21

Open Electives II (VIII Semester)		
Sl. No.	Subject Code	Name of Elective(s)
1	ROE081	Digital and Social Media Marketing
2	ROE082	Entrepreneurship Development
3	ROE083	Machine Learning
4	ROE084	Micro and Smart Systems
5	ROE085	Operations Research
6	ROE086	Renewable Energy Resources
7	ROE087	*Human Values in Madhyasth Darshan
8	ROE088	*Values, Relationship & Ethical Human Conduct-For a Happy & Harmonious Society
9	**ROE089**	**Industrial Optimization Techniques**

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 two subjects (ROE087 & ROE088) only trained Faculty (who had done the FDP for these courses) will teach the courses.

ROE081 DIGITAL AND SOCIAL MEDIA MARKETING L T P 3 0 0

UNIT-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.
UNIT-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
UNIT-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).
UNIT-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
UNIT-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,

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 Share the Formula for Tangible Returns on Your Marketing Investment; McGraw-Hill Professional (October, 2013).
4. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page (3rd Edition, 2014).
5. Tracy L. Tuten & Michael R. Solomon: Social Media Marketing (Sage Publication)

ROE082 ENTREPRENEURSHIP DEVELOPMENT L T P 3 0 0

UNIT-I	Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.
UNIT-II	Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.
UNIT-III	Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.
UNIT-IV	Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.
UNIT-V	Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India

ROE083 MACHINE LEARNING L T P 3 0 0

UNIT-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
UNIT-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;
UNIT-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;
UNIT-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
UNIT-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.

Text books:

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.

ROE084 MICRO AND SMART SYSTEMS L T P 3 0 0

UNIT-I	Introduction, Why miniaturization?, Microsystems versus MEMS, Why micro fabrication?, smart materials, structures and systems, integrated Microsystems, applications of smart materials and Microsystems.
UNIT-II	Micro sensors, actuators, systems and smart materials: Silicon capacitive accelerometer, piezoresistive pressure sensor, conductometric gas sensor, an electrostatic combo-drive, a magnetic microrelay, portable blood analyzer, piezoelectric inkjet print head, micromirror array for video projection, smart materials and systems.
UNIT-III	Micromachining technologies: silicon as a material for micro machining, thin film deposition, lithography, etching, silicon micromachining, specialized materials for Microsystems, advanced processes for micro fabrication.
UNIT-IV	Modeling of solids in Microsystems: Bar, beam, energy methods for elastic bodies, heterogeneous layered beams, bimorph effect, residual stress and stress gradients, poisson effect and the anticlastic curvature of beams, torsion of beams and shear stresses, dealing with large displacements, In-plane stresses, Modelling of coupled electromechanical systems: electrostatics, Coupled Electro-mechanics: statics, stability and pull-in phenomenon, dynamics. Squeezed film effects in electromechanics.
UNIT-V	Integration of micro and smart systems: integration of Microsystems and microelectronics, microsystems packaging, case studies of integrated Microsystems, case study of a smart-structure in vibration control. Scaling effects in Microsystems: scaling in: mechanical domain, electrostatic domain, magnetic domain, diffusion, effects in the optical domain, biochemical phenomena.

Text books:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat and V. K. Atre, “Micro and smart systems”, Wiley India, 2010.

ROE085 OPERATIONS RESEARACH L T P 3 0 0

UNIT-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.
UNIT-II	Transportation Problems: Types of transportation problems, mathematical models , transportation algorithms, Assignment: Allocation and assignment problems and models, processing of job through machines.
UNIT-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.
UNIT-IV	Theory of Games : Rectangular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized poisson queing model, single server models.
UNIT-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.

Text books:

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.

ROE086: RENEWABLE ENERGY RESOURCES L T P 3 0 0

UNIT-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.
UNIT-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 energy storage for solar heating and cooling, limitations.
UNIT-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.
UNIT-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.
UNIT-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.

Text books:

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.

ROE 087	Human Values in Madhyasth Darshan	L	T	P	C
		3	0	0	3
Version No.:	2.0 (updated as on June 12th 2019				
Prerequisite:	RVE 301/401- Universal Human Values and Professional Ethics				

Objectives:

1. To help students understand the basic principles of Madhyasth Darshan
2. To help students understand the existential realities including the human existence through Madhyasth Darshan
3. To help them to see the participation of human beings in the nature/ existential realities (i.e. human values) and therefore the human conduct through each one of them
4. To help students apply this understanding to make their living better at different levels- individual, family, society and nature
5. To facilitate the students in applying this understanding in their profession and lead an ethical life

Course Outcome: On completion of this course, the students will be able to

1. Understand the basic concepts of Madhyasth Darshan
2. Understand the human being, the needs and activities of human being through Madhyasth Darshan
3. Understand the whole existence
4. Understand the role of human being in the entire existence, thus getting clarity about values at all levels of living and human conduct
5. Understand the foundation of human society and human tradition.

Catalogue Description: Madhyasth Darshan is a new emerging philosophy that describes the existential realities along with its implication in behaviour and work at the level of individual as well as society. This philosophy has been propounded by Shri A. Nagraj in seventies.

It is to be kept in mind that Darshan means realisation which calls for developing the capacity to see the reality in oneself directly. So, any study of Darshan shall help develop this capacity in the students through proper steps of practices and shall not just provide the information.

Module I: Introduction to Madhyasth Darshan and its Basics

Need to study Madhyasth Darshan; introduction, basic formulations of the darshan; the complete expanse of study and the natural outcome of living according to the darshan.

Module II: Submergence of Nature in Space

The ever-present existence in the form of nature submerged in space; nature classified into two categories – material and consciousness, and four orders; the form, property, natural characteristic and self-organization of the four orders, General direction and process of evolution in the nature/ existence.

Module III: Human Being as an indivisible part of Nature

Human being as an indivisible part of nature; various types (five classes) of human beings; human being in the combination of self and body; purpose of self as realization, prosperity for the body; need of behavior and work for attaining the goals of realization and prosperity.

Module IV: Fulfillment of human goal of realization and prosperity

Following natural, social and psychological principles for actualizing the human goal; form of conducive society and order for such practices, study process- achieving realization through self-study and practice while living in such a society (social order).

Module V: Human Conduct based on Madhyasth Darshan

Description of such a realized self, continuity of happiness, peace, satisfaction and bliss through realization, conduct of a realized human being.

Possibility of finding solutions to present day problems (such as inequality of rich and poor, man and woman etc.) in the light of it.

Text Books:

1. Nagraj, A., "*Manav Vyavahar Darshan"*, Jeevan Vidya Prakashan, 3rd edition, 2003

References:

1. Nagraj, A., "*Vyavaharvadi Samajshastra"*, Jeevan Vidya Prakashan, 2nd edition, 2009.
2. Nagraj, A., "*Avartanasheel Arthashastra"*, Jeevan Vidya Prakashan, 1st edition, 1998.

Mode of Evaluation: Assignment/ Seminar/Continuous Assessment Test/Semester End Exam

ROE088 VALUES, RELATIONSHIP & ETHICAL HUMAN CONDUCT–FOR A HAPPY & HARMONIOUS SOCIETY L T P 3 0 0

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-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-human relationship and role of behavior in its fulfillment, Human-rest of Nature 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.

UNIT-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.

UNIT-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.

UNIT-IV	Program for Ensuring Undivided Society and Universal Human Order: Education –Sanskar, Health –Sanyam, Production-work, Exchange – storage, Justice-preservation.
UNIT-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.

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.
6. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA.
7. Human Society, Kingsley Davis, 1949.
8. Hind Swaraj or, Indian home rule Mohandas K. Gandhi, 1909.
9. Integral Humanism, Deendayal Upadhyaya, 1965.
10. Lohiya Ke Vichar, Lok Bharti , Rammanohar Lohiya, 2008.
11. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
12. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
13. Samadhanatmak Bhautikvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India
14. Small Is Beautiful: A Study of Economics as if People Mattered, E. F. Schumacher,1973, Blond & Briggs, UK.
15. Slow is Beautiful, Cecile Andrews (http://www.newsociety.com/Books/S/Slow-is- Beautiful)
16. Sociology Themes and Perspectives, Harper Collins; EIGHT edition (2014), Martin Holborn and Peter Langley, 1980.
17. Samagra kranti: Jaya Prakash Narayan's philosophy of social change, Siddharth Publications Renu Sinha, 1996.
18. Science & Humanism – towards a unified worldview, P. L. Dhar & R. R. Gaur (1990), Commonwealth Publishers, New Delhi
19. Vyavaharvadi Samajshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
20. Vyavahatmak Janvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
21. The Communist Manifesto, Karl Marx, 1848.
22. 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).

Subject Code	ROE089					
Category	Basic Science Course					
Subject Name	**Industrial Optimization Techniques**					
Scheme and Credits	**L-T-P**	**Theory Marks**	**Sessional**		**Total**	**Credit**
			Test	**Assig/Att.**		
	3—0—0	100	30	20	150	2
Pre- requisites (if any)	Knowledge of Engineering Mathematics, I, II, III, & IV					

Course Objectives:

The objective of this course is to familiarize the graduate engineers with techniques in linear programming, sequencing and network analysis, theory of games and Queueing models, Dynamic Programming and Simulation and Inventory control and Replacement Models. It aims to equip the students with standard concepts and tools from previously gained knowledge to an advanced level that will enable them to tackle more advanced level of Optimization techniques and applications that they would find useful in their disciplines.

The students will learn:

- To apply the knowledge of linear programming and application in the field of engineering.
- To deal with sequencing and network analysis for optimizing the results of real life problems and Engineers.
- To deals with Theory of Games and Queueing Models to solve engineering problems involving real life situations etc.
- To deal with dynamic programming and simulation that is required in different branches of Engineering to graduate engineers for applying real pictures in case of complicated systems.
- To deals with inventory control and replacement Models to solve engineering problems involving real market and real life situations etc.

ROE-089 Industrial Optimization Techniques		
Unit	**Topic**	**Lectures**
1	**Linear Programming:** Historical development of optimization, engineering application of optimization, formulation of design problems as a mathematical programing problem. Graphical method of solution, Simplex method, Dual Simplex method and its application in engineering. **Transportation and Assignment:** Introduction**,** Mathematical formulations, optimal solution of transportation model. Assignment problems: mathematical formulation, solution of Assignment models (Hungarian method), variation of the Assignment problem, the travelling sales man problem and their application in Engineering.	**8**
2	**Sequencing and Network Analysis:** Introduction of sequencing, General assumptions, n Jobs through 2 machines, n jobs through 3 machines, *n* jobs through *m* machines, 2 jobs through *m* machines and their applications in Engineering. **Network Analysis: Introduction,** Network logic (Network or arrow diagram), Rules for drawing network diagrams, time analysis, forward and backward computation CPM and PERT, and their applications in Engineering.	**8**
3	**Theory of Games and Queueing Models:** Introduction, 2 person zero sum games, Maximin and minimax principle, game with saddle point and without saddle point, Principle of dominance, Rectangular games, graphical solution of 2 x n or m x 2 games. **Queuing model:** Introduction, Application of Queuing model, generalized Poisson queuing model, single server models and multiple channel Queuing model and their applications in Engineering.	**8**

4	**Dynamic Programming and Simulation**: Introduction Formulation of Dynamic Programming Problem, Dynamic Programming Algorithm, Forward recursions, Capital Budgeting Problem, Cargo-loading Problem. Solution of LPP by DPP **Simulation:** Introduction, definition and types of simulation, need for Simulation advantage and disadvantage, application of simulation, simulation procedure, Monte Carlo simulation and their applications in Engineering.	**8**
5	**Inventory Control and Replacement Models:** Introduction, types of inventories, Inventory cost, Deterministic and probabilistic (nondeterministic) inventory models and their application in engineering. **Replacement models:** Introduction, definition, Replacement of items that deteriorate, Replacement of items that fail suddenly, Equipment Renewal Problem, Individual and Group Replacement policies & their applications in Engineering	**8**

Text Books:

1. Singiresu S. Rao. "Engineering Optimization" Theory and Practice". New Age
2. International, New Delhi.
3. R. Panneerselvam. "Operations Research ". Prentice- Hall of India, New Delhi
4. Eliezer Naddor. "Inventory Systems". John Wiley & Sons, Inc. New York

Reference Books:

1. H.A. Taha: Operations Research – An Introduction, Macmillan Publishing Company, Inc., New York.
2. K. Swarup, P.K. Gupta, M. Mohan: "Operations Research", Sultan Chand and Sons, New Delhi.
3. P.K. Gupta, D.S. Hira: "Operations Research" – An Introduction, S. Chand & Company Limited, New Delhi.
4. S.S. Rao: "Optimization Theory and Applications", Wiley Eastern Ltd., New Delhi.
5. J.K. Sharma: "Operations Research: Theory and Applications", Mac Millan India Ltd.

COURSE OUTCOMES:

	Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of this course, the students will be able to:		
CO 1	Remember the concept of simultaneous equations, apply for evaluating mathematical programming problems to evaluate optimal solution	K_1, K_3& K_5
CO 2	Understand the concept of extrema to create, critical path and analyzing for application in Engineering.	K_2,K_3& K_6
CO 3	Remember the concept of matrices, maxima and minimize to evaluate the value of the game and create the model	K_1 ,K_5&K_6
CO 4	Analyze the concept of simulation in different ways by simulation techniques methods.	K_4& K_3
CO 5	Applying the concept of extrema to evaluate inventory and replenishment problems	K_3& K_5

K_1 – Remember, K_2 – Understand, K_3 – Apply, K_4 – Analyze, K_5 – Evaluate, K_6 – Create

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

EVALUATION SCHEME & SYLLABUS

FOR

OPEN ELECTIVES I
(VI SEMESTER)

AS PER

AICTE MODEL CURRICULUM
[Effective from the Session: 2020-21]

B.Tech. VI Semester

OPEN ELECTIVE-I

KOE060	**IDEA TO BUSINESS MODEL**
KOE061	REAL TIME SYSTEMS
KOE062	EMBEDDED SYSTEM
KOE063	INTRODUCTION TO MEMS
KOE064	OBJECT ORIENTED PROGRAMMING
KOE065	COMPUTER BASED NUMERICAL TECHNIQUES
KOE066	GIS & REMOTE SENSING
KOE067	BASICS OF DATA BASE MANAGEMENT SYSTEM
KOE068	SOFTWARE PROJECT MANAGEMENT
KOE069	*UNDERSTANDING THE HUMAN BEING COMPREHENSIVELY-HUMAN ASPIRATIONS AND ITS FULFILLMENT

NOTE:

1. The Student shall choose an open Elective Subject from the list of open elective courses in such a manner that he/she has not studied the same course in any form during the degree programme.
2. The students shall choose an Open Elective course from the prescribed list of open elective courses available at University website for 3rd year (2020-21) in such a manner that he/she has not studied the same subject or allied subject in any semester during the entire degree program.
3. Subject to aforesaid condition, the open Elective courses may be offered from the department to all students irrespective of branch. There is no restriction related to branch. The students of any branch (irrespective of department) can select the open elective subjectsfrom the prescribed list of open elective courses.
4. * It is mandatory that for subjects (KOE069) only trained Faculty (who had done the FDP for these courses) will teach the courses.

KOE-060 IDEA TO BUSINESS MODEL

Course Objectives:

1. This course can motivate students to have an overall idea how to start and sustain a business enterprise.
2. The students will learn basics of choosing an idea of a business model.
3. The core areas of choosing a business model are encompassed with Entrepreneurship development, PPC & communication system. The students will thus develop basic competencies how to run a business enterprise.

Unit	Topics	Lectures
I	**Introduction** Search for a business idea- How to choose an idea- Product idea- selection of product- The adoption process- Product innovation- Production , planning and development strategy- New product idea.	8
II	Introduction to Entrepreneurship - Meaning and concept of entrepreneurship- Difference between Entrepreneurship & wage employment - Functions of an Entrepreneur.- Entrepreneur vs Manager- role of entrepreneurship in economic development – Barriers to entrepreneurship.	8
III	The Entrepreneur - types of entrepreneurs- Competencies required to become an entrepreneur - Creative and Design Thinking, the entrepreneurial decision process- The process of Entrepreneurial development prog (EDP)- Evaluation of EDP - Entrepreneur development training.	8
IV	Production system- Design of production system- Types of production system- Production, planning & control (PPC) - Steps of PPC.	8
V	Communication- Importance of communication system - barriers to communication - listening to people- the power of talk - personal selling - risk taking & resilience - negotiation.	8

Text Books:

1. Entrepreneurship Development- Sangeeta Sharma, Kindle edition
2. Production & operations Management- Kanishka Bedi,
3. Marketing Management- Philip Kotler.
4. The Business Model Book: Design, build and adapt business ideas that drive business growth: Adam Bock , Gerard George

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

1. Enhance creative knowledge of students regarding selection of a business idea and it's implementation process.
2. Acquire knowledge on entrepreneurship development, its Pro's and con's.
3. Acquire basic knowledge on how to become an Entrepreneur.
4. Develop knowledge on Production systems and it's sustainability through production, planning and control (PPC)
5. Develop appropriate business model and apply in a better way.

KOE-061 REAL TIME SYSTEMS

Unit	Topics	Lectures
I	**Introduction** Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Dead-lines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.	8
II	**Real Time Scheduling** Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.	8
III	**Resources Sharing** Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Module Resources, Controlling Concurrent Accesses to Data Objects.	8
IV	**Real Time Communication** Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols.	
V	**Real Time Operating Systems and Databases** Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Con-currency Control, Overview of Commercial Real Time databases.	8

Text Books:

1. Real Time Systems – Jane W. S. Liu, Pearson Education Publication.

Reference Books:

1. Real Time Systems – Mall Rajib, Pearson Education
2. Real-Time Systems: Scheduling, Analysis, and Verification – Albert M. K. Cheng, Wiley.

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

1. Describe concepts of Real-Time systems and modeling.
2. Recognize the characteristics of a real-time system in context with real time scheduling.
3. Classify various resource sharing mechanisms and their related protocols.
4. Interpret the basics of real time communication by the knowledge of real time models and protocols.
5. Apply the basics of RTOS in interpretation of real time systems.

KOE-062 EMBEDDED SYSTEM

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

1. Attain the knowledge of embedded system and its development environment.
2. Gain the knowledge of RTOS based embedded system design and its applications.

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

CO1: Understand the basics of embedded system and its structural units.
CO3: Analyze the embedded system specification and develop software programs.
CO3: Evaluate the requirements of the programming embedded systems, related software architecture.
CO3: Understand the RTOS based embedded system design.
CO3: Understand all the applications of the embedded system and designing issues.

KOE-062 EMBEDDED SYSTEM		
Unit	**Topic**	**Lectures**
1	Introduction to Embedded Systems: Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.	**8**
2	Embedded Networking: Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols – RS232 standard – RS422 – RS485 – CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.	**8**
3	Embedded Firmware Development Environment: Embedded Product Development Life Cycle objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.	**8**
4	RTOS Based Embedded System Design: Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, чC/OS-II, RT Linux.	**8**
5	Embedded System Application Development: Design issues and techniques Case Study of Washing Machine- Automotive Application- Smart card System Application.	**8**

Text Books:

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.
2. Michael J. Pont, "Embedded C", Pearson Education , 2007.
3. Steve Heath, "Embedded System Design", Elsevier, 2005.
4. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051
5. Microcontroller and Embedded Systems", Pearson Education, Second edition, 2007.

KOE-063 INTRODUCTION TO MEMS

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

1. Understand the Basic concept of MEMS, Mechanics of Beam and Diaphragm Structures, Air Damping and Electrostatic Actuation.
2. Know the knowledge of Thermal Effects and the Applications of MEMS in RF.

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

CO1: Understand the Basic concept of MEMS Fabrication Technologies, Piezoresistance Effect, Piezoelectricity, Piezoresistive Sensor.
CO2: Explain Mechanics of Beam and Diaphragm Structures.
CO3: Understand the Basic concept of Air Damping and Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model.
CO4: Know the concept of Electrostatic Actuation.
CO5: Understand the applications of MEMS in RF

KOE-063 INTRODUCTION TO MEMS		
Unit	**Topic**	**Lectures**
1	**Introduction to MEMS:** MEMS Fabrication Technologies, Materials and Substrates for MEMS, Processes for Micromachining, Characteristics, Sensors/Transducers, Piezoresistance Effect, Piezoelectricity, Piezoresistive Sensor.	**8**
2	**Mechanics of Beam and Diaphragm Structures:** Stress and Strain, Hooke's Law. Stress and Strain of Beam Structures: Stress, Strain in a Bent Beam, Bending Moment and the Moment of Inertia, Displacement of Beam Structures Under Weight, Bending of Cantilever Beam Under Weight.	**8**
3	**Air Damping:** Drag Effect of a Fluid: Viscosity of a Fluid, Viscous Flow of a Fluid, Drag Force Damping, The Effects of Air Damping on Micro-Dynamics. Squeeze-film Air Damping: Reynolds' Equations for Squeeze-film Air Damping, Damping of Perforated Thick Plates. Slide-film Air Damping: Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model.	**8**
4	**Electrostatic Actuation:** Electrostatic Forces, Normal Force, Tangential Force, Fringe Effects, Electrostatic Driving of Mechanical Actuators: Parallel-plate Actuator, Capacitive sensors. Step and Alternative Voltage Driving: Step Voltage Driving, Negative Spring Effect and Vibration Frequency.	**8**
5	**Thermal Effects:** Temperature coefficient of resistance, Thermo-electricity, Thermocouples, Thermal and temperature sensors. **Applications of MEMS in RF** MEMS Resonator Design Considerations, One-Port Micromechanical Resonator Modeling Vertical Displacement Two-Port Microresonator Modeling, Micromechanical Resonator Limitations.	**8**

Text & Reference Books:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat and V. K. Atre, "Micro and smart systems", Wiley India, 2010.
2. S.M. Sze, "Semiconductor Sensors", John Wiley & Sons Inc., Wiley Interscience Pub.
3. M.J. Usher, "Sensors and Transducers", McMillian Hampshire.
4. RS Muller, Howe, Senturia and Smith, "Micro sensors", IEEE Press.

KOE-064 OBJECT ORIENTED PROGRAMMING

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

1. Understand the Basic concept of Object Orientation, object identity and Encapsulation.
2. Know the knowledge of Basic Structural Modeling, Object Oriented Analysis and C++ Basics.

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

CO1: Understand the Basic concept of Object Orientation, object identity and Encapsulation.
CO2: Understand the Basic concept of Basic Structural Modeling.
CO3: Know the knowledge of Object oriented design, Object design.
CO4: Know the knowledge of C++ Basics.
CO5: Understand the Basics of object and class in C++.

KOE-064 OBJECT ORIENTED PROGRAMMING		
Unit	**Topic**	**Lectures**
1	Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modelling, principles of modelling, object oriented modelling, Introduction to UML, conceptual model of the UML, Architecture.	**8**
2	Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class &Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, call-back mechanism, broadcast messages. Basic Behavioural Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams	**8**
3	Object Oriented Analysis: Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD).Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.	**8**
4	C++ Basics : Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures C++ Functions : Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions	**8**
5	Objects and Classes : Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion. Inheritance : Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class Polymorphism : Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism	**8**

Text Books:

1. James Rumbaugh et. al, “Object Oriented Modeling and Design”, PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education
3. Object Oriented Programming with C++, E Balagurusamy, TMH

Reference Books:

1. R. S. Salaria, Mastering Object Oriented Programming with C++, Khanna Publishing House
2. C++ Programming, Black Book, Steven Holzner, dreamtech
3. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia
4. Object Oriented Programming with ANSI and Turbo C++, Ashok Kamthane, Pearson
5. The Compete Reference C++, Herbert Schlitz, TMH
6. C++ and Object Oriented Programming Paradigm, PHI
7. C++ : How to Program, 9th Edition, Deitel and Deitel, PHI

KOE 065: COMPUTER BASED NUMERICAL TECHNIQUES

Course Objectives:

The objective of this course is to familiarize the graduate engineers with techniques in errors, approximations, approximates roots, Interpolation, finite differences, numerical differentiation and integration programming, numerical solution of differential equations and boundary value problems. It aims to equip the students with standard concepts and tools from previously gained knowledge to an advanced level that will enable them to tackle more advanced level of Optimization techniques and applications that they would find useful in their disciplines.

The students will learn:

- To apply the knowledge of errors, roots and application in the field of engineering.
- To deal deals with finite differences and interpolation to solve engineering problems involving complicated real life situations etc.
- To deal with numerical integration and differentiation that is required in different branches of Engineering to graduate engineers for applying more difficult problems in case of complex structures.
- To deals with numerical solution of differential Equations for engineering problems involving real life situations etc.
- To deal with boundary value problems of real life systems and Engineers.

KOE 065 COMPUTER BASED NUMERICAL TECHNIQUES		
Unit	**Topic**	**Lectures**
1	**Error and roots of Algrabraic and Transcendental Equations:** Introduction of Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation. Solution of Algebraic and Transcendental Equation**:** Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Methods of finding real and complex roots, Muller's method, Rate of convergence of Iterative methods, Polynomial Equations.	**8**
2	**Interpolation:** Introduction Finite Differences, Difference tables Polynomial Interpolation: Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula. Interpolation with unequal intervals: Lagrange's Interpolation, Newton Divided difference formula, Hermite's Interpolation.	**8**
3	**Numerical Integration and Differentiation**: Introduction: Numerical differentiation of Newton's forward and backward formula, Stirling's, Bessel's, Everett's formula, Lagrange's Interpolation and Newton Divided difference formula. **Numerical Integration**: Newton cotes formula, Trapezoidal rule, Simpson's 1/3 and 3/8 rules, Boole's rule, Waddle's rule.	**8**
4	**Solution of differential Equations:** Introduction, Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta Methods, Predictor Corrector Methods, Automatic Error Monitoring and Stability of solution.	**8**
5	**Boundary Value problems:** Introduction, Finite difference method, solving Eigen value problems, polynomial method and power methods. Numerical solution of Partial Differential equations. Elliptic, Parabolic and hyperbolic PDEs. Distillation in a Plate Column, Unsteady-state Operation, Starting a Stirred-tank Reactor, Rate at which a Plate Absorber Approaches Steady State.	**8**

Note: PS: Practice session: Students should practice the Flow Charts and algorithm of some important programs

Text Books:

1. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age International.
2. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi**.**

Reference Books

1. Rajaraman V, Computer Oriented Numerical Methods, Pearson Education
2. T Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods, McGraw Hill
3. Pradip Niyogi, Numerical Analysis and Algorithms, McGraw Hill.
4. Francis Scheld, Numerical Analysis, McGraw Hill.
5. Sastry S. S, Introductory Methods of Numerical Analysis, Pearson Education.
6. Kiusalaas, J.: Numerical methods in engineering with MATLAB, Cambridge University Press
7. Woodford, C and Phillips, C: Numerical methods with worked examples: MATLAB Edition, Springer

COURSE OUTCOMES: At the end of this course, the students will be able to:

	Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
CO 1	Understand the concept of errors to evaluate approximate roots of several types of equations	K_2& K_5
CO 2	Analyze the problem and evaluate data by different interpolation methods and creating interpolating graphs	K_4, K_5&K_6
CO 3	Understand the concept of interpolation to analyze and evaluate the numerical differentiation and integration	K_2 & K_5
CO 4	Remember the concept of formula based the solution of ordinary differential equations to evaluate differential equations withy initial conditions	K_1&K_5
CO 5	Apply the concept of partial differential equation to evaluate the partial differential equations	K_3& K_5

K_1 – Remember, K_2 – Understand, K_3 – Apply, K_4 – Analyze, K_5 – Evaluate, K_6 – Create

KOE 066 GIS & REMOTE SENSING

COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. Understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

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

CO1: Understand about the principles of Remote Sensing and its advantages and limitations.
CO2: Retrieve the information content of remotely sensed data.
CO3: Apply problem specific remote sensing data for engineering applications.
CO4: Analyze spatial and attribute data for solving spatial problems.
CO5: Create GIS and cartographic outputs for presentation

KOE-066 GIS & REMOTE SENSING		
Unit	**Topic**	**Lectures**
1	Basic component of remote sensing (RS), advantages and limitations of RS, possible use of RS techniques in assessment and monitoring of land and water resources; electromagnetic spectrum, energy interactions in the atmosphere and with the Earth's surface; major atmospheric windows; principal applications of different wavelength regions; typical spectral reflectance curve for vegetation, soil and water, spectral signatures.	**8**
2	Different types of sensors and platforms; contrast ratio and possible causes of low contrast; aerial photography; types of aerial photographs, scale of aerial photographs, planning aerial photography- end lap and side lap; stereoscopic vision, requirements of stereoscopic photographs; air-photo interpretation- interpretation elements;	**8**
3	Photogrammetry- measurements on a single vertical aerial photograph, measurements on a stereo-pair- vertical measurements by the parallax method; ground control for aerial photography; satellite remote sensing, multispectral scanner- whiskbroom and push-broom scanner; different types of resolutions; analysis of digital data- image restoration; image enhancement; information extraction, image classification, unsupervised classification, supervised classification, important consideration in the identification of training areas, vegetation indices.	**8**
4	Microwave remote sensing. GI Sand basic components, different sources of spatial data, basic spatial entities, major components of spatial data, Basic classes of map projections and their properties. .	**8**
5	Methods of data input into GIS, Data editing, spatial data models and structures, Attribute data management, integrating data (map overlay) in GIS, Application of remote sensing and GIS for the management of land and water resources.	**8**

Text & Reference Books:

1. Reddy Anji, M. 2006. Textbook of Remote Sensing and Geographical Information Systems. BS Publications, Hyderabad.
2. Elangovan, K. 2006. GIS Fundamentals Applications and Implementations. New India Publication Agency, New Delhi.
3. George Joseph. 2005. Fundamentals of Remote Sensing. 2nd Edition. Universities Press (India) Private Limited, Hyderabad.
4. Jensen, J.R. 2013. Remote Sensing of the Environment: An Earth Resource Perspective. Pearson Education Limited, UK.
5. Lillesand, T., R.W. Kiefer and J. Chipman. 2015. Remote Sensing and Image Interpretation. 7th Edition, John Wiley and Sons Singapore Pvt. Ltd., Singapore.
6. Sabins, F.F. 2007. Remote Sensing: Principles and Interpretation. Third Edition, Waveland Press Inc., Illinois, USA.

KOE-067 BASICS OF DATA BASE MANAGEMENT SYSTEM

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to:		
CO 1	Describe the features of a database system and its application and compare various types of data models.	K_2
CO 2	Construct an ER Model for a given problem and transform it into a relation database schema.	K_5, K_6
CO 3	Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.	K_5, K_6
CO 4	Explain the need of normalization and normalize a given relation to the desired normal form.	K_2, K_3
CO 5	Explain different approaches of transaction processing and concurrency control.	K_2

DETAILED SYLLABUS		3-0-0
Unit		**Lecture**
I	**Introduction:** An overview of database management system, database system vs file system, database system concepts and architecture, views of data – levels of abstraction, data models, schema and instances, data independence, database languages and interfaces, data definition languages, DML, overall database structure, transaction management, storage management, database users and administrator. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.	**08**
II	**Relational Database Concepts:** Introduction to relational database, relational database structure, relational model terminology – domains, attributes, tuples, relations & relational database schema, integrity constraints, entity integrity, referential integrity, keys constraints, domain constraints, Relational algebra - relational calculus, tuple and domain calculus, basic operations – selection and projection, set-theoretic operations, join operations. **Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, & third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
III	**Structured Query Language (SQL):** Basics of SQL, DDL, DML, DCL, advantage of SQL, SQL data type and literals, types of SQL commands, SQL operators and their procedure, tables – creation & alteration, defining constraints, views and indexes, queries and sub queries, aggregate functions, built-in functions, insert, update and delete operations, joins, unions, intersection, minus, transaction control commands. **PL/SQL:** Introduction, features, syntax and constructs, SQL within Pl/SL, DML in PL/SQL Cursors, stored procedures, stored function, database triggers, indices	**08**
IV	**Transaction Processing Concepts:** Transaction concepts, properties of transaction, testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, recovery from transaction failures, two-phase commit protocol, log based recovery, checkpoints, deadlock handling. **Concurrency Control Techniques:** Concurrency control, locking techniques for concurrency control, time stamping protocols for concurrency control, validation based protocol, multiple granularity, multi-version schemes, recovery with concurrent transaction.	**08**

V	**Database Security** – Types of security, system failure, backup & recovery techniques, authorization & authentication, system policies, levels of security – physical, OS, network & DBMS, privileges – grant & revoke. **Recent Trends in Database Management Systems:** Centralized and Client-Server Architectures, Distributed Databases, Object-Oriented Database, Spatial & Temporal Databases, Decision Support Systems, Data Analysis, Data Mining & Warehousing, Data Visualization, Mobile Databases, OODB & XML Databases, Multimedia & Web Databases, Spatial and Geographical Databases, Web and Mobile Databases, Active Databases	**08**

Text books:

1. Elmasri, Navathe, "Fundamentals of Database System", Addision Wesley.
2. Korth, Silbertz, Sudarshan, "Database Concepts", Mc Graw Hill.
3. Bipin C. Desai, "An Introduction to Database System", Galgotia Publication.
4. Majumdar & Bhattacharya, "Database Management System", McGraw Hill.
5. Date C.J., "An Introduction to Database System", Addision Wesley.
6. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill.
7. Atul Kahate, "Introduction to Database Management Systems", Pearson Education.
8. Paul Beynon Davies, "Database System", Palgrave Macmillan.
9. Bharti P.K., " An Introduction to Database Systems", JPNP.
10. Rajesh Narang, "Database Management System", PHI.
11. Singh, S.K., "Database System Concepts – design & application", Pearson Education.
12. Leon & Leon, "Database Management Systems", Vikas Publishing House.
13. O'Neil, "Databases", Elsevier Pub.
14. Ivan Bayross, "SQL, PL/SQL – The Programming Language of Oracle", BPB Publications.
15. P.S. Deshpande, "SQL and PL/SQL for Oracle 10g, Black Book", Dreamtech Press.
16. George Koch, Kevin Loney, "Oracle: The Complete Reference", McGraw Hill.
17. Coronel, Morris and Rob, "Database Principles: Fundamentals of Design, Implementation and Management", Cengage Learning.
18. Gillenson, Paulraj Ponniah, "Introduction to Database Management", Wiley.
19. G. K. Gupta, "Database Management Systems", McGraw Hill.
20. Shraman Shah, "Oracle for Professional", SPD.

KOE-068 SOFTWARE PROJECT MANAGEMENT		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able :		
CO 1	Identify project planning objectives, along with various cost/effort estimation models.	K_3
CO 2	Organize & schedule project activities to compute critical path for risk analysis.	K_3
CO 3	Monitor and control project activities.	K_4, K_5
CO 4	Formulate testing objectives and test plan to ensure good software quality under SEI-CMM.	K_6
CO 5	Configure changes and manage risks using project management tools.	K_2, K_4

DETAILED SYLLABUS		**3-0-0**
Unit		**Lecture**
I	**Project Evaluation and Project Planning :** Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.	**08**
II	**Project Life Cycle and Effort Estimation :** Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.	**08**
III	**Activity Planning and Risk Management :** Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning – Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.	**08**
IV	**Project Management and Control:** Framework for Management and control Collection of data Visualizing progress – Cost monitoring Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control Software Configuration Management – Managing contracts – Contract Management.	**08**
V	**Staffing in Software Projects :** Managing people – Organizational behavior – Best methods of staff selection Motivation – The Oldham Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams Decision making Organizational structures Dispersed and Virtual teams – Communications genres Communication plans Leadership.	**08**

Text books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011.
3. Walker Royce: ―Software Project Management- Addison-Wesley, 1998.
4. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.

KOE-069 UNDERSTANDING THE HUMAN BEING COMPREHENSIVELY – HUMAN ASPIRATIONS AND ITS FULFILLMENT

Course Objectives:

1. To help the students having the clarity about human aspirations, goal, activities and purpose of life.
2. To facilitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence.
3. To help the students to develop the understanding of human tradition and its various components.

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 preconditioning and present beliefs.

KOE-069 UNDERSTANDING THE HUMAN BEING COMPREHENSIVELY- HUMAN ASPIRATIONS AND ITS FULFILLMENT		
Unit	**Topic**	**Lectures**
1	**Introduction:** The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.	**8**
2	**Understanding Human being and its expansion:** The domain of right understanding starts from understanding the human being (the knower, the experience and the doer); and extends up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).	**8**
3	**Activities of the Self:** Understanding the human being comprehensively is the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Reasons for harmony/contradiction in the self.	**8**
4	**Understanding Co-existence with other orders:** The need and the process of inner evolution (through self-exploration, selfawareness and self-evaluation)- particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).	**8**
5	**Expansion of harmony from self to entire existence:** Understanding different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavour viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from self to Nature and entire Existence.	**8**

Reference Books:

1. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Sangal, G. P. Bagaria (2010), Excel Books, New Delhi [ISBN 978-8-174-46781-2]
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
3. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India
4. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA
5. Ishandi Nau Upnishad, Shankaracharya, Geeta press, Gorakhpur,
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

EVALUATION SCHEME & SYLLABUS
FOR
B. TECH. THIRD YEAR

Computer Science
Computer Engineering
Computer Science and Engineering
(Computer Science and Engineering/CS)

On

Choice Based Credit System

(Effective from the Session: 2020-21)

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

B.TECH (COMPUTER SCIENCE & ENGINEERING/ COMPUTER SCIENCE)
CURRICULUM STRUCTURE

SEMESTER- V													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
			L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1	KCS501	Database Management System	3	1	0	30	20	50		100		150	4
2	KCS502	Compiler Design	3	1	0	30	20	50		100		150	4
3	KCS503	Design and Analysis of Algorithm	3	1	0	30	20	50		100		150	4
4	Deptt. Elective-I	Departmental Elective-I	3	0	0	30	20	50		100		150	3
5	Deptt. Elective-II	Departmental Elective-II	3	0	0	30	20	50		100		150	3
6	KCS551	Database Management System Lab	0	0	2				25		25	50	1
7	KCS552	Compiler Design Lab	0	0	2				25		25	50	1
8	KCS553	Design and Analysis of Algorithm Lab	0	0	2				25		25	50	1
9	KCS554	Mini Project or Internship Assessment*****	0	0	2				50			50	1
10	KNC501/ KNC502	Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			
11		MOOCs (Essential for Hons. Degree)											
		Total	**17**	**3**	**8**							**950**	**22**

*****The Mini Project or internship (4 weeks) conducted during summer break after IV semester and will be assessed during V semester.

SEMESTER- VI												
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
			L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1	KCS601	Software Engineering	3	1	0	30	20	50		100		150	4
2	KCS602	Web Technology	3	1	0	30	20	50		100		150	4
3	KCS603	Computer Networks	3	1	0	30	20	50		100		150	4
4	Deptt. Elective-III	Departmental Elective-III	3	0	0	30	20	50		100		150	3
5		Open Elective-I [Annexure - B(iv)]	3	0	0	30	20	50		100		150	3
6	KCS651	Software Engineering Lab	0	0	2				25		25	50	1
7	KCS652	Web Technology Lab	0	0	2				25		25	50	1
8	KCS653	Computer Networks Lab	0	0	2				25		25	50	1
9	KNC601/ KNC602	Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			
10		MOOCs (Essential for Hons. Degree)											
		Total	**0**	**3**	**6**							**900**	**21**

Departmental Elective-I

1. KCS-051 Data Analytics
2. KCS-052 Web Designing
3. KCS-053 Computer Graphics
4. KCS-054 Object Oriented System Design

Departmental Elective-II

1. KCS-055 Machine Learning Techniques
2. KCS-056 Application of Soft Computing
3. KCS-057 Augmented & Virtual Reality
4. KCS-058 Human Computer Interface

Departmental Elective-III

1. KCS-061 Big Data
2. KCS-062 Image Processing
3. KCS-063 Real Time Systems
4. KCS-064 Data Compression

B.TECH. (CSE & CS)

FIFTH SEMESTER (DETAILED SYLLABUS)

Database Management System (KCS501)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Apply knowledge of database for real life applications.	K_3
CO 2	Apply query processing techniques to automate the real time problems of databases.	K_3, K_4
CO 3	Identify and solve the redundancy problem in database tables using normalization.	K_2, K_3
CO 4	Understand the concepts of transactions, their processing so they will familiar with broad range of database management issues including data integrity, security and recovery.	K_2, K_4
CO 5	Design, develop and implement a small database project using database tools.	K_3, K_6

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	**08**
II	**Relational data Model and Language:** Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQl Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	**08**
III	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
IV	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.	**08**
V	**Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	**08**

Text books:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fundamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon & Leon,"Database Management Systems", Vikas Publishing House
7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
8. Majumdar & Bhattacharya, "Database Management System", TMH

Compiler Design (KCS-502)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.	K_3, K_6
CO 2	Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.	K_2, K_6
CO 3	Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.	K_4, K_5
CO 4	Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.	K_2, K_3
CO 5	Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.	K_2, K_4

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Compiler**: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	**08**
II	**Basic Parsing Techniques:** Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	**08**
III	**Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	**08**
IV	**Symbol Tables**: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	**08**
V	**Code Generation:** Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**08**

Text books:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press
3. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, McGraw-Hill,2003.
4. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
5. V Raghvan, " Principles of Compiler Design", McGraw-Hill,
6. Kenneth Louden," Compiler Construction", Cengage Learning.
7. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

Design and Analysis of Algorithm (KCS503)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.	K_4, K_6
CO 2	Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).	K_5, K_6
CO 3	Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.	K_2, K_5
CO 4	Apply classical sorting, searching, optimization and graph algorithms.	K_2, K_4
CO 5	Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.	K_2, K_3
DETAILED SYLLABUS		**3-1-0**

Unit	Topic	Proposed Lecture
I	**Introduction:** Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	**08**
II	**Advanced Data Structures:** Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List	**08**
III	**Divide and Conquer** with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. **Greedy Methods** with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford Algorithms.	**08**
IV	**Dynamic Programming** with Examples Such as Knapsack. All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	**08**
V	**Selected Topics:** Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms	**08**

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
4. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill
5. Richard E.Neapolitan "Foundations of Algorithms" Jones & Bartlett Learning
6. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
7. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
8. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
9. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
10. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
11. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

Data Analytics (KCS-051)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to :		
CO 1	Describe the life cycle phases of Data Analytics through discovery, planning and building.	K1,K2
CO 2	Understand and apply Data Analysis Techniques.	K2, K3
CO 3	Implement various Data streams.	K3
CO 4	Understand item sets, Clustering, frame works & Visualizations.	K2
CO 5	Apply R tool for developing and evaluating real time applications.	K3,K5,K6

DETAILED SYLLABUS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Data Analytics:** Sources and nature of data, classification of data (structured, semi-structured, unstructured), characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. **Data Analytics Lifecycle:** Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, operationalization.	**08**
II	**Data Analysis:** Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction, neural networks: learning and generalisation, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods.	**08**
III	**Mining Data Streams:** Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications, Case studies – real time sentiment analysis, stock market predictions.	**08**
IV	**Frequent Itemsets and Clustering:** Mining frequent itemsets, market based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream, clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern based clustering methods, clustering in non-euclidean space, clustering for streams and parallelism.	**08**
V	**Frame Works and Visualization:** MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques, interaction techniques, systems and applications. **Introduction to R** - R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.	**08**

Text books and References:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press.
3. Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & Sons.
4. John Garrett, Data Analytics for IT Networks : Developing Innovative Use Cases, Pearson Education

5. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
6. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big Data Analytics”, EMC Education Series, John Wiley
7. Frank J Ohlhorst, “Big Data Analytics: Turning Big Data into Big Money”, Wiley and SAS Business Series
8. Colleen Mccue, “Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis”, Elsevier
9. Michael Berthold, David J. Hand,” Intelligent Data Analysis”, Springer
10. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill
11. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer
12. Mark Gardner, “Beginning R: The Statistical Programming Language”, Wrox Publication
13. Pete Warden, Big Data Glossary, O’Reilly
14. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons
15. Pete Warden, Big Data Glossary, O’Reilly.
16. Peter Bühlmann, Petros Drineas, Michael Kane, Mark van der Laan, "Handbook of Big Data", CRC Press
17. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier

Web Designing (KCS-052)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Understand principle of Web page design and about types of websites	K_3, K_4
CO 2	Visualize and Recognize the basic concept of HTML and application in web designing.	K_1, K_2
CO 3	Recognize and apply the elements of Creating Style Sheet (CSS).	K_2, K_4
CO 4	Understand the basic concept of Java Script and its application.	K_2, K_3
CO 5	Introduce basics concept of Web Hosting and apply the concept of SEO	K_2, K_3

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction :** Basic principles involved in developing a web site, Planning process , Domains and Hosting, Responsive Web Designing , Types of Websites (Static and Dynamic Websites), Web Standards and W3C recommendations, **Introduction to HTML:** What is HTML , HTML Documents, Basic structure of an HTML document , Creating an HTML document , Mark up Tags , Heading-Paragraphs , Line Breaks	**08**
II	**Elements of HTML:** HTML Tags., Working with Text , Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls	**08**
III	**Concept of CSS:** Creating Style Sheet, CSS Properties , CSS Styling(Background, Text Format, Controlling Fonts) , Working with block elements and objects , Working with Lists and Tables , CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties) CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) , CSS Color , Creating page Layout and Site Designs.	**08**
IV	Introduction to Client Side Scripting , Introduction to Java Script , Javascript Types , Variables in JS, Operators in JS , Conditions Statements , Java Script Loops, JS Popup Boxes , JS Events , JS Arrays, Working with Arrays, JS Objects ,JS Functions , Using Java Script in Real time , Validation of Forms, Related Examples	**08**
V	**Web Hosting:** Web Hosting Basics , Types of Hosting Packages, Registering domains , Defining Name Servers , Using Control Panel, Creating Emails in Cpanel , Using FTP Client, Maintaining a Website **Concepts of SEO :** Basics of SEO, Importance of SEO, Onpage Optimization Basics	**08**

Text Books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible, 5ed", Wiley India
2. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design", Wiley India

Computer Graphics (KCS-053)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Understand the graphics hardware used in field of computer graphics.	K_2
CO 2	Understand the concept of graphics primitives such as lines and circle based on different algorithms.	K_2, K_4
CO 3	Apply the 2D graphics transformations, composite transformation and Clipping concepts.	K_4
CO 4	Apply the concepts of and techniques used in 3D computer graphics, including viewing transformations.	K_2, K_3
CO 5	Perform the concept of projections, curve and hidden surfaces in real life.	K_2, K_3

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction and Line Generation:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.	**08**
II	**Transformations:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. **Windowing and Clipping:** Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping	**08**
III	**Three Dimensional:** 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.	**08**
IV	**Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	**08**
V	**Hidden Lines and Surfaces:** Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	**08**

Text books:

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education.
3. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill
4. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – McGraw Hill.
5. Amrendra N Sinha and Arun D Udai," Computer Graphics", McGraw Hill.
6. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
7. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.
8. Donald Hearn and M Pauline Baker, "Computer Graphics with Open GL", Pearson education

Object Oriented System Design (KCS-054)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Understand the application development and analyze the insights of object oriented programming to implement application	K_2, K_4
CO 2	Understand, analyze and apply the role of overall modeling concepts (i.e. System, structural)	K_2, K_3
CO 3	Understand, analyze and apply oops concepts (i.e. abstraction, inheritance)	K_2, K_3, K_4
CO 4	Understand the basic concepts of C++ to implement the object oriented concepts	K_2, K_3
CO 5	To understand the object oriented approach to implement real world problem.	K_2, K_3

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modelling, principles of modelling, object oriented modelling, Introduction to UML, conceptual model of the UML, Architecture.	**08**
II	**Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams. Class &Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams. **Collaboration Diagrams:** Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, call-back mechanism, broadcast messages. **Basic Behavioural Modeling:** Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams.	**08**
III	Object Oriented Analysis: Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. **Structured analysis and structured design (SA/SD),** Jackson Structured Development (JSD).Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation. **Object oriented programming style:** reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.	**08**
IV	**C++ Basics :** Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures **C++ Functions :** Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions	**08**
V	**Objects and Classes :** Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion. Inheritance : Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class **Polymorphism :** Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism	**08**

Text Books

1. James Rumbaugh et. al, "Object Oriented Modeling and Design", Pearson Education
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education
3. Object Oriented Programming With C++, E Balagurusamy, McGraw Hill.
4. C++ Programming, Black Book, Steven Holzner, dreamtech
5. Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia
6. Object Oriented Programming with ANSI and Turbo C++, Ashok Kamthane, Pearson
7. The Compete Reference C++, Herbert Schlitz, McGraw Hill.

Machine Learning Techniques (KCS 055)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able:		
CO 1	To understand the need for machine learning for various problem solving	K_1 , K_2
CO 2	To understand a wide variety of learning algorithms and how to evaluate models generated from data	K_1 , K_3
CO 3	To understand the latest trends in machine learning	K_2 , K_3
CO 4	To design appropriate machine learning algorithms and apply the algorithms to a real-world problems	K_4 , K_6
CO 5	To optimize the models learned and report on the expected accuracy that can be achieved by applying the models	K_4, K_5
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION** – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning;	**08**
II	**REGRESSION:** Linear Regression and Logistic Regression **BAYESIAN LEARNING -** Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. **SUPPORT VECTOR MACHINE:** Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel,and Gaussiankernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM.	**08**
III	**DECISION TREE LEARNING -** Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. **INSTANCE-BASED LEARNING** – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	**08**
IV	**ARTIFICIAL NEURAL NETWORKS** – Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks, Derivation of Backpropagation Algorithm, Generalization, Unsupervised Learning – SOM Algorithm and its variant; **DEEP LEARNING -** Introduction,concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-deriving car etc.	**08**
V	**REINFORCEMENT LEARNING**–Introduction to Reinforcement Learning , Learning Task,Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process , Q Learning - Q Learning function, Q Learning Algorithm), Application of Reinforcement Learning,Introduction to Deep Q Learning. **GENETIC ALGORITHMS:** Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications.	**08**

Text books:

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.

Application of Soft Computing (KCS- 056)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to :		
CO 1	Recognize the feasibility of applying a soft computing methodology for a particular problem	K_2, K_4
CO 2	Understand the concepts and techniques of soft computing and foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems.	K2,K_4, K_6
CO 3	Apply neural networks to pattern classification and regression problems and compare solutions by various soft computing approaches for a given problem.	K_3, K_5
CO 4	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems	K_3, K_4
CO 5	Apply genetic algorithms to combinatorial optimization problems	K3, K5

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Neural Networks-I (Introduction & Architecture) :** Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.	**08**
II	**Neural Networks-II (Back propagation networks):** Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.	**08**
III	**Fuzzy Logic-I (Introduction):** Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.	**08**
IV	**Fuzzy Logic –II (Fuzzy Membership, Rules)** : Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications	**08**
V	**Genetic Algorithm(GA):** Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.	**08**

Text books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India.
2. N. P. Padhy, "Artificial Intelligence and Intelligent Systems" Oxford University Press. Reference Books:
3. Siman Haykin, "Neural Netowrks", Pearson Education
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
5. Kumar Satish, "Neural Networks" McGraw Hill

Augmented & Virtual Reality (KCS- 057)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able :		
CO 1	To make students know the basic concept and understand the framework of virtual reality.	K_1 , K_2
CO 2	To understand principles and multidisciplinary features of virtual reality and apply it in developing applications.	K_2 , K_4
CO 3	To know the technology for multimodal user interaction and perception VR, in particular the visual, audial and haptic interface and behavior.	K_2 , K_3
CO 4	To understand and apply technology for managing large scale VR environment in real time.	K_2 , K_3
CO 5	To understand an introduction to the AR system framework and apply AR tools in software development.	K_2 , K_3,

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**VIRTUAL REALITY AND VIRTUAL ENVIRONMENTS:** The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality. HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES: Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces.	**08**
II	**3D USER INTERFACE INPUT HARDWARE:** Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces.	**08**
III	**SOFTWARE TECHNOLOGIES:** Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market	**08**
IV	**3D INTERACTION TECHNIQUES:** 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestrual Commands, Tools, Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry .	**08**

	DESIGNING AND DEVELOPING 3D USER INTERFACES: Strategies for Designing and Developing Guidelines and Evaluation. **VIRTUAL REALITY APPLICATIONS:** Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.	
V	Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.	**08**

Text books:

1. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.

2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.

3. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005.

4. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.

5. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.

6. John Vince, "Virtual Reality Systems", Addison Wesley, 1995.

7. Howard Rheingold, "Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society", Simon and Schuster, 1991.

8. William R Sherman and Alan B Craig, "Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002

9. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

Human Computer Interface (KCS- 058)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Understand and analyze the common methods in the user-centered design process and the appropriateness of individual methods for a given problem.	K_2, K_4
CO 2	Apply , adapt and extend classic design standards, guidelines, and patterns.	K_3, K_5
CO 3	Employ selected design methods and evaluation methods at a basic level of competence.	K_4, K_5
CO 4	Build prototypes at varying levels of fidelity, from paper prototypes to functional, interactive prototypes.	K_4, K_5
CO 5	Demonstrate sufficient theory of human computer interaction, experimental methodology and inferential statistics to engage with the contemporary research literature in interface technology and design.	K_3, K_4
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Importance of user Interface – definition, importance of 8 good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface	**08**
II	**Design process:** Human interaction with computers, importance of 8 human characteristics human consideration, Human interaction speeds, understanding business junctions. III Screen Designing : Design goals – Scre	**08**
III	**Screen Designing :** Design goals – Screen planning and purpose, 8 organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	**08**
IV	**Windows :** New and Navigation schemes selection of window, 8 selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors	**08**
V	**Software tools :** Specification methods, interface – Building Tools. 8 Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	**08**

Text books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.

2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

Database Management Systems Lab (KCS-551)

Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to:		
CO 1	Understand and apply oracle 11 g products for creating tables, views, indexes, sequences and other database objects.	K_2, K_4
CO 2	Design and implement a database schema for company data base, banking data base, library information system, payroll processing system, student information system.	K3, K5, K6
CO 3	Write and execute simple and complex queries using DDL, DML, DCL and TCL	K_4, K_5
CO 4	Write and execute PL/SQL blocks, procedure functions, packages and triggers, cursors.	K_4, K_5
CO 5	Enforce entity integrity, referential integrity, key constraints, and domain constraints on database.	K_3, K_4

DETAILED SYLLABUS

1. Installing oracle/ MYSQL
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL:
   a)Writing basic SQL SELECT statements.
   b) Restricting and sorting data.
   c)Displaying data from multiple tables.
   d)Aggregating data using group function.
   e)Manipulating data.
   e)Creating and managing tables.
4. Normalization
5. Creating cursor
6. Creating procedure and functions
7. Creating packages and triggers
8. Design and implementation of payroll processing system
9. Design and implementation of Library Information System
10. Design and implementation of Student Information System
11. Automatic Backup of Files and Recovery of Files
12. Mini project (Design & Development of Data and Application) for following :
    a) Inventory Control System.
    b) Material Requirement Processing.
    c) Hospital Management System.
    d) Railway Reservation System.
    e) Personal Information System.
    f) Web Based User Identification System.
    g) Timetable Management System.
    h) Hotel Management System

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner

It is also suggested that open source tools should be preferred to conduct the lab (MySQL , SQL server , Oracle ,MongoDB ,Cubrid ,MariaDBetc)

Database Management Systems Lab (KCS-551): Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Database Management Lab (KCS-551)	Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table)
	Data Manipulation Language(DML) Statements
	Data Query Language(DQL) Statements: (Select statement with operations like Where clause, Order by, Logical operators, Scalar functions and Aggregate functions)
	Transaction Control Language(TCL) statements: (Commit(make changes permanent), Rollback (undo)
	Describe statement: To view the structure of the table created

COMPILER DESIGN LAB (KCS-552)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Identify patterns, tokens & regular expressions for lexical analysis.	K_2, K_4
CO 2	Design Lexical analyser for given language using C and LEX /YACC tools	K_3, K_5
CO 3	Design and analyze top down and bottom up parsers.	K_4, K_5
CO 4	Generate the intermediate code	K_4, K_5
CO 5	Generate machine code from the intermediate code forms	K_3, K_4

DETAILED SYLLABUS

1. Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines.
2. Implementation of Lexical Analyzer using Lex Tool
3. Generate YACC specification for a few syntactic categories.
   a) Program to recognize a valid arithmetic expression that uses operator +, – , * and /.
   b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
   c) Implementation of Calculator using LEX and YACC
   d) Convert the BNF rules into YACC form and write code to generate abstract syntax tree
4. Write program to find ε – closure of all states of any given NFA with ε transition.
5. Write program to convert NFA with ε transition to NFA without ε transition.
6. Write program to convert NFA to DFA
7. Write program to minimize any given DFA.
8. Develop an operator precedence parser for a given language.
9. Write program to find Simulate First and Follow of any given grammar.
10. Construct a recursive descent parser for an expression.
11. Construct a Shift Reduce Parser for a given language.
12. Write a program to perform loop unrolling.
13. Write a program to perform constant propagation.
14. Implement Intermediate code generation for simple expressions.
15. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using an 8086 assembler. The target assembly instructions can be simple move, add, sub, jump etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
It is also suggested that open source tools should be preferred to conduct the lab (C, C++ , Lex or Flex and YACC tools (Unix/Linux utilities)etc)

Design and Analysis of Algorithm Lab (KCS-553)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Implement algorithm to solve problems by iterative approach.	K_2, K_4
CO 2	Implement algorithm to solve problems by divide and conquer approach	K_3, K_5
CO 3	Implement algorithm to solve problems by Greedy algorithm approach.	K_4, K_5
CO 4	Implement algorithm to solve problems by Dynamic programming, backtracking, branch and bound approach.	K_4, K_5
CO 5	Implement algorithm to solve problems by branch and bound approach.	K_3, K_4

DETAILED SYLLABUS

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Knapsack Problem using Greedy Solution
8. Perform Travelling Salesman Problem
9. Find Minimum Spanning Tree using Kruskal's Algorithm
10. Implement N Queen Problem using Backtracking
11. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.
12. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.
13.6. Implement , the 0/1 Knapsack problem using
   (a) Dynamic Programming method
   (b) Greedy method.
14. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
15. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.
16. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
17. Write programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.
   (b) Implement Travelling Sales Person problem using Dynamic programming.
18. Design and implement to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
19. Design and implement to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
It is also suggested that open source tools should be preferred to conduct the lab (C, C++ etc)

B.TECH. (CSE & CS)

SIXTH SEMESTER (DETAILED SYLLABUS)

Software Engineering (KCS-601)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course, the student will be able to		
CO 1	Explain various software characteristics and analyze different software Development Models.	K_1, K_2
CO 2	Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards.	K_1, K_2
CO 3	Compare and contrast various methods for software design	K_2, K_3
CO 4	Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing.	K_3
CO 5	Manage software development process independently as well as in teams and make use of Various software management tools for development, maintenance and analysis.	K_5

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	**08**
II	**Software Requirement Specifications (SRS):** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	**08**
III	**Software Design:** Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	**08**
IV	**Software Testing:** Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, TopDown and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	**08**
V	**Software Maintenance and Software Project Management:** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts,	**08**

	Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	

Text books:

1.RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.

2. Pankaj Jalote, Software Engineering, Wiley

3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.

4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.

6. Ian Sommerville, Software Engineering, Addison Wesley.

7. Kassem Saleh, "Software Engineering", Cengage Learning.

8. P fleeger, Software Engineering, Macmillan Publication

Web Technology (KCS-602)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Explain web development Strategies and Protocols governing Web.	K_1, K_2
CO 2	Develop Java programs for window/web-based applications.	K_2, K_3
CO 3	Design web pages using HTML, XML, CSS and JavaScript.	K_2, K_3
CO 4	Creation of client-server environment using socket programming	K_1, K_2,
CO 5	Building enterprise level applications and manipulate web databases using JDBC	K_3, K_4
CO6	Design interactive web applications using Servlets and JSP	K_2, K_3

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	I**ntroduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols Governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers	**08**
II	**Web Page Designing:** HTML: List, Table, Images, Frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML	**08**
III	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, **Networking :** Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagram.	**08**
IV	**Enterprise Java Bean:** Preparing a Class to be a JavaBeans, Creating a JavaBeans, JavaBeans Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean **Java Database Connectivity (JDBC):** Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.	**08**
V	**Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with Http Session **Java Server Pages (JSP):** Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries..	**08**

Text books:

1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley
2. Xavier, C, " Web Technology and Design" , New Age International
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication
4. Bhave, "Programming with Java", Pearson Education
5. Herbert Schieldt, "The Complete Reference:Java", McGraw Hill.
6. Hans Bergsten, "Java Server Pages", SPD O'Reilly
7. Margaret Levine Young, "The Complete Reference Internet", McGraw Hill.
8. Naughton, Schildt, "The Complete Reference JAVA2", McGraw Hill.
9. Balagurusamy E, "Programming in JAVA", McGraw Hill.

Computer Networks(KCS- 603)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission	K_1,K_2
CO2	Apply channel allocation, framing, error and flow control techniques.	K_3
CO3	Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.	K_2,K_3
CO4	Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.	K_2,K_3
CO5	Explain the functions offered by session and presentation layer and their Implementation.	K_2,K_3
CO6	Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.	K_2

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introductory Concepts**: Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), The OSI reference model, TCP/IP protocol suite, Network devices and components. **Physical Layer:** Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	**08**
II	**Link layer:** Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms).	**08**
III	**Network Layer:** Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing, Routing algorithms and protocols, Congestion control algorithms, IPv6.	**08**
IV	**Transport Layer:** Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.	**08**
V	**Application Layer:** Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression, Cryptography – basic concepts.	**08**

Text books and References:

1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill
2. Andrew Tanenbaum "Computer Networks", Prentice Hall.
3. William Stallings, "Data and Computer Communication", Pearson.
4. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson.
5. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann
6. W. A. Shay, "Understanding Communications and Networks", Cengage Learning.
7. D. Comer, "Computer Networks and Internets", Pearson.
8. Behrouz Forouzan, "TCP/IP Protocol Suite", McGraw Hill.

Big Data(KCS-061)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Demonstrate knowledge of Big Data Analytics concepts and its applications in business.	K_1,K_2
CO 2	Demonstrate functions and components of Map Reduce Framework and HDFS.	K_1,K_2
CO 3	Discuss Data Management concepts in NoSQL environment.	K_6
CO 4	Explain process of developing Map Reduce based distributed processing applications.	K_2,K_5
CO 5	Explain process of developing applications using HBASE, Hive, Pig etc.	K_2,K_5
DETAILED SYLLABUS		**3-0-0**

Unit	Topic	Proposed Lectures
I	**Introduction to Big Data**: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.	**06**
II	**Hadoop:** History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. **Map Reduce:** Map Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce	**08**
III	**HDFS (Hadoop Distributed File System):** Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data structures. **Hadoop Environment:** Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud	**08**
IV	**Hadoop Eco System and YARN**: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features - NameNode high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN. **NoSQL Databases:** Introduction to NoSQL **MongoDB:** Introduction, data types, creating, updating and deleing documents, querying, introduction to indexing, capped collections **Spark:** Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN **SCALA:** Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance.	**09**
V	**Hadoop Eco System Frameworks**: Applications on Big Data using Pig, Hive and HBase **Pig** - Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators,	**09**

	Hive - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries. **HBase** – Hbase concepts, clients, example, Hbase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, BigInsights and Big Sheets, introduction to Big SQL.	

Text books and References:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
2. Big-Data Black Book, DT Editorial Services, Wiley
3. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, “Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill.
4. Thomas Erl, Wajid Khattak, Paul Buhler, “Big Data Fundamentals: Concepts, Drivers and Techniques”, Prentice Hall.
5. Bart Baesens “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons
6. ArshdeepBahga, Vijay Madisetti, “Big Data Science & Analytics: A HandsOn Approach “, VPT
7. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP
8. Tom White, "Hadoop: The Definitive Guide", O'Reilly.
9. Eric Sammer, "Hadoop Operations", O'Reilly.
10. Chuck Lam, “Hadoop in Action”, MANNING Publishers
11. Deepak Vohra, “Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools”, Apress
12. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilly
13. Lars George, "HBase: The Definitive Guide", O'Reilly.
14. Alan Gates, "Programming Pig", O'Reilly.
15. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer
16. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons
17. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons
18. Pete Warden, “Big Data Glossary”, O’Reilly

Image Processing (KCS-062)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able:		
CO 1	Explain the basic concepts of two-dimensional signal acquisition, sampling, quantization and color model.	K_1, K_2
CO 2	Apply image processing techniques for image enhancement in both the spatial and frequency domains.	K_2, K_3
CO 3	Apply and compare image restoration techniques in both spatial and frequency domain.	K_2, K_3
CO 4	Compare edge based and region based segmentation algorithms for ROI extraction.	K_3, K_4
CO 5	Explain compression techniques and descriptors for image processing.	K_2, K_3
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**DIGITAL IMAGE FUNDAMENTALS:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.	**08**
II	**IMAGE ENHANCEMENT:** Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	**08**
III	**IMAGE RESTORATION:** Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	**08**
IV	**IMAGE SEGMENTATION:** Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	**08**
V	**IMAGE COMPRESSION AND RECOGNITION:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.	**08**

Text books:

1. Rafael C. Gonzalez, Richard E. Woods,Digital Image Processing Pearson, Third Edition, 2010
2. Anil K. Jain,Fundamentals of Digital Image Processing Pearson, 2002.
3. Kenneth R. Castleman,Digital Image Processing Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
5. D,E. Dudgeon and RM. Mersereau,Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.
6. William K. Pratt,Digital Image Processing John Wiley, New York, 2002
7. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

Real Time System (KCS-063)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able:		
CO 1	illustrate the need and the challenges in the design of hard and soft real time systems.	K_3
CO 2	Compare different scheduling algorithms and the schedulable criteria.	K_4
CO 3	Discuss resource sharing methods in real time environment.	K_3
CO 4	Compare and contrast different real time communication and medium access control techniques.	K_4, K_5
CO 5	Analyze real time Operating system and Commercial databases	K_2, K_4

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction** Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.	**05**
II	**Real Time Scheduling** Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-DeadlineFirst (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.	**09**
III	**Resources Sharing** Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.	**09**
IV	**Real Time Communication** Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols	**09**
V	**Real Time Operating Systems and Databases** Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases	**08**

Text books:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, "Real Time Systems", Pearson Education
4. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

Data Compression (KCS-064)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Describe the evolution and fundamental concepts of Data Compression and Coding Techniques.	K_1, K_2
CO 2	Apply and compare different static coding techniques (Huffman & Arithmetic coding) for text compression.	K_2, K_3
CO 3	Apply and compare different dynamic coding techniques (Dictionary Technique) for text compression.	K_2, K_3
CO 4	Evaluate the performance of predictive coding technique for Image Compression.	K_2, K_3
CO 5	Apply and compare different Quantization Techniques for Image Compression.	K_2,K_3
DETAILED SYLLABUS		**3-0-0**

Unit	Topic	Proposed Lecture
I	Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.	**08**
II	The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.	**08**
III	Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Moveto-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.	**08**
IV	Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.	**08**
V	Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.	**08**

Text books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition, Khalid Sayood,The Morgan aufmann Series
4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer
5.Text Compression1st Edition by Timothy C. Bell Prentice Hall

Software Engineering Lab (KCS-661)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement	K_2, K_4
CO 2	Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship	K_3, K_5
CO 3	Draw a class diagram after identifying classes and association among them	K_4, K_5
CO 4	Graphically represent various UML diagrams , and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially	K_4, K_5
CO 5	Able to use modern engineering tools for specification, design, implementation and testing	K_3, K_4

DETAILED SYLLABUS

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion) 11. Draw the deployment diagram.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner It is also suggested that open source tools should be preferred to conduct the lab (Open Office , Libra , Junit, Open Project , GanttProject , dotProject, AgroUML, StarUML etc.)

Software Engineering Lab (KCS-661): Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Software Engineering Lab (KCS-661)	Identifying the Requirements from Problem Statements
	Estimation of Project Metrics
	Modeling UML Use Case Diagrams and Capturing Use Case Scenarios
	E-R Modeling from the Problem Statements
	Identifying Domain Classes from the Problem Statements
	Statechart and Activity Modeling
	Modeling UML Class Diagrams and Sequence diagrams
	Modeling Data Flow Diagrams
	Estimation of Test Coverage Metrics and Structural Complexity
	Designing Test Suites

Web Technology Lab (KCS-652)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Develop static web pages using HTML	K_2, K_3
CO 2	Develop Java programs for window/web-based applications.	K_2, K_3
CO 3	Design dynamic web pages using Javascript and XML.	K_3, K_4
CO 4	Design dynamic web page using server site programming Ex. ASP/JSP/PHP	K_3, K_4
CO 5	Design server site applications using JDDC,ODBC and section tracking API	K_3, K_4

DETAILED SYLLABUS

This lab is based on the Web Technologies. Some examples are as follows:

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
3. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
8. Install TOMCAT web server and APACHE. Access the above developed static web pages for books web site, using these servers by putting the web pages developed.
9. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. Create a Cookie and add these four user id's and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.
10. Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
11. Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database
12. Design and implement a simple shopping cart example with session tracking API.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
It is also suggested that open source tools should be preferred to conduct the lab (Java , JSP , Bootstrap Firebug , WampServer , MongoDB, etc)

Computer Networks Lab (KCS-663)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to		
CO 1	Simulate different network topologies.	K_3, K_4
CO 2	Implement various framing methods of Data Link Layer.	K_3, K_4
CO 3	Implement various Error and flow control techniques.	K_3, K_4
CO 4	Implement network routing and addressing techniques.	K_3, K_4
CO 5	Implement transport and security mechanisms	K_3, K_4

DETAILED SYLLABUS

1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting .
8. Applications using TCP Sockets like
   a. Echo client and echo server b. Chat c. File Transfer
9. Applications using TCP and UDP Sockets like d. DNS e. SNMP f. File Transfer
10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. i. Link State routing ii. Flooding iii. Distance vector
12. To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc.
13. Configuration of router, hub, switch etc. (using real devices or simulators)
14. Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc.
15. Network packet analysis using tools like Wireshark, tcpdump, etc.
16. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
17. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
It is also suggested that open source tools should be preferred to conduct the lab (C , C++ , Java , NS3, Mininet, Opnet, TCP Dump, Wireshark etc.

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Open Electives to be offered by the CSE/CS/IT/CSI Branches

Open Elective-1	
KOE-067	Basics of Data Base Management System
KOE-068	Software Project Management

Basics of Data Base Management System (KOE-067)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to:		
CO 1	Describe the features of a database system and its application and compare various types of data models.	K_2
CO 2	Construct an ER Model for a given problem and transform it into a relation database schema.	K_5, K_6
CO 3	Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.	K_5, K_6
CO 4	Explain the need of normalization and normalize a given relation to the desired normal form.	K_2, K_3
CO 5	Explain different approaches of transaction processing and concurrency control.	K_2
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** An overview of database management system, database system vs file system, database system concepts and architecture, views of data – levels of abstraction, data models, schema and instances, data independence, database languages and interfaces, data definition languages, DML, overall database structure, transaction management, storage management, database users and administrator. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.	**08**
II	**Relational Database Concepts:** Introduction to relational database, relational database structure, relational model terminology – domains, attributes, tuples, relations & relational database schema, integrity constraints, entity integrity, referential integrity, keys constraints, domain constraints, Relational algebra - relational calculus, tuple and domain calculus, basic operations – selection and projection, set-theoretic operations, join operations. **Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, & third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
III	**Structured Query Language (SQL):** Basics of SQL, DDL, DML, DCL, advantage of SQL, SQL data type and literals, types of SQL commands, SQL operators and their procedure, tables – creation & alteration, defining constraints, views and indexes, queries and sub queries, aggregate functions, built-in functions, insert, update and delete	**08**

	operations, joins, unions, intersection, minus, transaction control commands. **PL/SQL:** Introduction, features, syntax and constructs, SQL within Pl/SL, DML in PL/SQL Cursors, stored procedures, stored function, database triggers, indices	
IV	**Transaction Processing Concepts:** Transaction concepts, properties of transaction, testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, recovery from transaction failures, two-phase commit protocol, log based recovery, checkpoints, deadlock handling. **Concurrency Control Techniques:** Concurrency control, locking techniques for concurrency control, time stamping protocols for concurrency control, validation based protocol, multiple granularity, multi-version schemes, recovery with concurrent transaction.	**08**
V	**Database Security** – Types of security, system failure, backup & recovery techniques, authorization & authentication, system policies, levels of security – physical, OS, network & DBMS, privileges – grant & revoke. **Recent Trends in Database Management Systems:** Centralized and Client-Server Architectures, Distributed Databases, Object-Oriented Database, Spatial & Temporal Databases, Decision Support Systems, Data Analysis, Data Mining & Warehousing, Data Visualization, Mobile Databases, OODB & XML Databases, Multimedia & Web Databases, Spatial and Geographical Databases, Web and Mobile Databases, Active Databases	**08**

Text Books and References:

1. Elmasri, Navathe, "Fundamentals of Database System", Addision Wesley.
2. Korth, Silbertz, Sudarshan, "Database Concepts", Mc Graw Hill.
3. Bipin C. Desai, "An Introduction to Database System", Galgotia Publication.
4. Majumdar & Bhattacharya, " Database Management System", McGraw Hill..
5. Date C.J., "An Introduction to Database System", Addision Wesley.
6. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill.
7. Atul Kahate, "Introduction to Database Management Systems", Pearson Education.
8. Paul Beynon Davies, "Database System", Palgrave Macmillan.
9. Bharti P.K., " An Introduction to Database Systems", JPNP.
10. Rajesh Narang, "Database Management System", PHI.
11. Singh, S.K., "Database System Concepts – design & application", Pearson Education.
12. Leon & Leon, "Database Management Systems", Vikas Publishing House.
13. O'Neil, "Databases", Elsevier Pub.
14. Ivan Bayross, "SQL, PL/SQL – The Programming Language of Oracle", BPB Publications.
15. P.S. Deshpande, "SQL and PL/SQL for Oracle 10g, Black Book", Dreamtech Press.
16. George Koch, Kevin Loney, "Oracle: The Complete Reference", McGraw Hill..
17. Coronel, Morris and Rob, "Database Principles: Fundamentals of Design, Implementation and Management", Cengage Learning.
18. Gillenson, Paulraj Ponniah, "Introduction to Database Management", Wiley.
19. G. K. Gupta, "Database Management Systems", McGraw Hill.
20. Shraman Shah, "Oracle for Professional", SPD.

Software Project Management (KOE-068)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able :		
CO 1	Identify project planning objectives, along with various cost/effort estimation models.	K_3
CO 2	Organize & schedule project activities to compute critical path for risk analysis.	K_3
CO 3	Monitor and control project activities.	K_4, K_5
CO 4	Formulate testing objectives and test plan to ensure good software quality under SEI-CMM.	K_6
CO 5	Configure changes and manage risks using project management tools.	K_2, K_4

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Project Evaluation and Project Planning :** Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.	**08**
II	**Project Life Cycle and Effort Estimation :** Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.	**08**
III	**Activity Planning and Risk Management :** Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.	**08**
IV	**Project Management and Control:** Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.	**08**
V	**Staffing in Software Projects :** Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.	**08**

Text books:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011.
3. Walker Royce: ―Software Project Management- Addison-Wesley, 1998.
4. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.