

Revised Structure B. Tech 1st Year (Common)

**BUNDELKHAND INSTITUTE OF ENGINEERING
& TECHNOLOGY, JHANSI**



**REVISED EVALUATION SCHEME
&
SYLLABUS**

**FOR
B. TECH. I YEAR**

**ELECTRONICS AND COMMUNICATION ENGINEERING
ON**

(AICTE MODEL CURRICULUM)

[Effective from the Session: 2020-21]

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

Revised Structure B. Tech 1st Year

B. Tech 1st Year

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**

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			
11	MOOCs	(For B.Tech. Hons. Degree)*											
		Total										900	20

Revised Structure B. Tech 1st Year

B.Tech. II Semester

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			
	MOOCs	(For B.Tech. Hons. Degree)*											
		Total										900	20

**B.Tech 1st Year
I Semester
Syllabus**

Revised Structure B. Tech 1st Year

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. Fraunhofer 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 – Aurther 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

Revised Structure B. Tech 1st Year

KAS-102T KAS-202T	ENGINEERING 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.

Revised Structure B. Tech 1st Year

KAS 103T	ENGINEERING MATHEMATICS 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

Revised Structure B. Tech 1st Year

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

Revised Structure B. Tech 1st Year

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

Revised Structure B. Tech 1st Year

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, 8th 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 Differential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th 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, 1st 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

Revised Structure B. Tech 1st Year

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 resistance using 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

Revised Structure B. Tech 1st Year

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 biprism	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/IUugrqMOY7E (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/ind ex.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	

Revised Structure B. Tech 1st Year

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.

Revised Structure B. Tech 1st Year

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/abs/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/abs/determination-of-hardness-nitk/index.html

Revised Structure B. Tech 1st Year

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.

REVISED FIRST YEAR SYLLABUS 2020-21

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>)

REVISED FIRST YEAR SYLLABUS 2020-21

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.

REVISED FIRST YEAR SYLLABUS 2020-21

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)	3
	Diode Application: Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits	3
	Special Purpose two terminal Devices: Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes, Liquid-Crystal Displays.	2
II	Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration	4
	Field Effect Transistor: Construction and Characteristic of JFETs. Transfer Characteristic. MOSFET (MOS) (Depletion and Enhancement) Type, Transfer Characteristic.	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.	4
	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
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.	6
	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits.	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.	4
	Introduction to Data Communications: Goals and applications of Networks. General Model of Wireless Communication: Evolution of mobile radio communication fundamentals, GPRS, GSM, CDMA. Elements of Satellite & Radar Communication,	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

REVISED FIRST YEAR SYLLABUS 2020-21

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

Unit	Topics	Lectures
I	<p>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.</p> <p>Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.</p> <p>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.</p>	8
II	<p>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 associativity.</p> <p>Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.</p>	8
III	<p>Loops & Functions: Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.</p> <p>Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.</p>	8
IV	<p>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.</p> <p>Basic Algorithms: Searching & Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.</p>	8
V	<p>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)</p> <p>File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.</p>	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.

REVISED FIRST YEAR SYLLABUS 2020-21

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.

REVISED FIRST YEAR SYLLABUS 2020-21

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

Unit	Topics	Lectures
I	<p>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.</p>	8
II	<p>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.</p>	10
III	<p>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.</p>	7
IV	<p>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.</p>	8
V	<p>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.</p>	10

REVISED FIRST YEAR SYLLABUS 2020-21

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

REVISED FIRST YEAR SYLLABUS 2020-21

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

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, Bath, sink, shower, etc. Prism, Cylinder, Pyramid, Cone–Auxiliary Views: 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	<p>Computer Graphics: Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Toolbars (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];</p> <p>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;</p> <p>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 paper 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.</p>	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.

REVISED FIRST YEAR SYLLABUS 2020-21

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. Applying computer-aided geometric design
6. Analysis of Isometric views
7. Creating working drawings

REVISED FIRST YEAR SYLLABUS 2020-21

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.	3 Hours
	Making of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint	
5	Welding Shop	
	Introduction to BI standards and reading of welding drawings.	

REVISED FIRST YEAR SYLLABUS 2020-21

	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.

REVISED FIRST YEAR SYLLABUS 2020-21

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.

REVISED FIRST YEAR SYLLABUS 2020-21

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.

REVISED FIRST YEAR SYLLABUS 2020-21

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 $a = \sqrt{s(s-a)(s-b)(s-c)}$
	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=ax ² +b ² if n=3 y=a-bx if n=4 y=a+x/b

REVISED FIRST YEAR SYLLABUS 2020-21

	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 $1!+2!+3!+\dots+n!$
	10	Write a program to find the sum of following series $1-X1/1!+X2/2!-\dots+Xn/n!$.
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: <pre> 3 2 1 2 1 1 * ** *** </pre>
	14	Write a program to receive a five-digit no and display as like 24689: <pre> 2 4 6 8 9 </pre>
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 $S=1!+2!+\dots+n!$.
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

REVISED FIRST YEAR SYLLABUS 2020-21

		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/>

REVISED FIRST YEAR SYLLABUS 2020-21

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 Arithmetic
	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>

REVISED FIRST YEAR SYLLABUS 2020-21

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.

REVISED FIRST YEAR SYLLABUS 2020-21

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 V_{rms} , V_{dc} , 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/

REVISED FIRST YEAR SYLLABUS 2020-21

KMC 101/201	ARTIFICIAL 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

REVISED FIRST YEAR SYLLABUS 2020-21

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

REVISED FIRST YEAR SYLLABUS 2020-21

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	Multicopter 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

REVISED FIRST YEAR SYLLABUS 2020-21

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

REVISED FIRST YEAR SYLLABUS 2020-21

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.

REVISED FIRST YEAR SYLLABUS 2020-21

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.

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.

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.

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 don't'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.

Literary

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

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.

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.

REVISED FIRST YEAR SYLLABUS 2020-21

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.

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.

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)

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.

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.

REVISED FIRST YEAR SYLLABUS 2020-21

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.

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.)

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.

**BUNDELKHAND INSTITUTE OF ENGINEERING
& TECHNOLOGY, JHANSI**



**EVALUATION SCHEME & SYLLABUS
FOR
B. TECH. SECOND YEAR
ELECTRONICS AND COMMUNICATION
ENGINEERING**

**AS PER
AICTE MODEL CURRICULUM
[Effective from the Session: 2019-20]**

B.Tech. (Electronics & Communication Engg.)

Semester III

Sr. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
	KOE031-38/ KAS302	Engg. Science Course /Maths IV	3	1	0	30	20	50		100		150	4
1.	KAS301/ KVE301	Technical Communication /Universal Human values	2	1	0	30	20	50		100		150	3
			3	0	0								
2.	KEC301	Electronic Devices	3	1	0	30	20	50		100		150	4
3.	KEC302	Digital System Design	3	1	0	30	20	50		100		150	4
4.	KEC303	Network Analysis and Synthesis	3	0	0	30	20	50		100		150	3
6.	KEC351	Electronics Devices Lab	0	0	2				25		25	50	1
7.	KEC352	Digital System Design Lab	0	0	2				25		25	50	1
8.	KEC353	Network Analysis and Synthesis lab	0	0	2				25		25	50	1
9.	KEC354	Mini Project or Internship Assessment	0	0	2			50				50	1
10.	KNC301 /KNC302	Computer System Security /Python Programming	2	0	0	15	10	25		50			0
11.		MOOCs (Essential for Hons. Degree)											
		TOTAL										950	22

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

Semester IV

Sr. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1.	KAS402/ KOE041-48	Maths-IV / Engg. Science Course	3	1	0	30	20	50		100		150	4
2.	KVE401/ KAS401	Universal Human Values/ Technical Communication	3	0	0	30	20	50		100		150	3
			2	1	0								
3.	KEC401	Communication Engineering	3	0	0	30	20	50		100		150	3
4.	KEC402	Analog Circuits	3	1	0	30	20	50		100		150	4
5.	KEC403	Signal System	3	1	0	30	20	50		100		150	4
6.	KEC451	Communication Engineering Lab	0	0	2				25		25	50	1
7.	KEC452	Analog Circuits Lab	0	0	2				25		25	50	1
8.	KEC453	Signal System Lab	0	0	2				25		25	50	1
9.	KNC402/ KNC401	Python Programming/ Computer System Security	2	0	0	15	10	25		50			0
10.		MOOCs (Essential for Hons. Degree)											
		TOTAL										900	21

KEC301	Electronics Devices	3L:1T:0P	4 Credits
---------------	----------------------------	-----------------	------------------

Unit	Topics	Lectures
I	Introduction to semiconductor physics: Review of quantum mechanics, electrons in periodic lattices, E-k diagrams.	8
II	Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current, drift current, mobility and resistivity, sheet resistance, design of resistors.	8
III	Generation and recombination of carriers, Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models.	8
IV	Avalanche breakdown, Zener diode, Schottky diode, Bipolar Junction Transistor, I-V characteristics, Ebers-Moll model.	8
V	MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell.	8

Text /Reference Books:

1. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson, 2014.
2. D. Neamen , D. Biswas, "Semiconductor Physics and Devices," McGraw-Hill Education.
3. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2006.
4. C.T. Sah, "Fundamentals of Solid State Electronics," World Scientific Publishing Co. Inc, 1991.
5. Y. Tsvividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford univ. press, 2011.
6. Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.

Course Outcomes:

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

1. Understand the principles of semiconductor Physics.
 2. Understand and utilize the mathematical models of semiconductor junctions.
 3. Understand carrier transport in semiconductors and design resistors.
 4. Utilize the mathematical models of MOS transistors for circuits and systems.
 5. Analyse and find application of special purpose diodes.
-

KEC302	Digital System Design	3L:1T:0P	4 Credits
---------------	------------------------------	-----------------	------------------

Unit	Topics	Lectures
I	Logic simplification and combinational logic design: Binary codes, code conversion, review of Boolean algebra and Demorgans theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, tabulation method.	8
II	MSI devices like comparators, multiplexers, encoder, decoder, driver & multiplexed display, half and full adders, subtractors, serial and parallel adders, BCD adder, barrel shifter and ALU.	8
III	Sequential logic design: Building blocks like S-R, JK and Master-Slave JK FF, edge triggered FF, state diagram, state reduction, design of sequential circuits, ripple and synchronous counters, shift registers, finite state machines, design of synchronous FSM, algorithmic state machines charts. Designing synchronous circuits like pulse train generator, pseudo random binary sequence generator, clock generation.	8
IV	Logic families and semiconductor memories: TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out, tristate TTL, ECL, CMOS families and their interfacing, memory elements, concept of programmable logic devices like FPGA, logic implementation using programmable devices.	8
V	Digital-to-Analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. analog-to-digital converters (ADC): single slope, dual slope, successive approximation, flash etc. switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.	8

Text/Reference Books:

1. R.P. Jain, "Modern Digital Electronics," Tata McGraw Hill, 4th edition, 2009.
2. A. Anand Kumar, "Fundamental of Digital Circuits," PHI 4th edition, 2018.
3. W.H. Gothmann, "Digital Electronics- An Introduction to Theory and Practice," PHI, 2nd edition, 2006.
4. D.V. Hall, "Digital Circuits and Systems," Tata McGraw Hill, 1989.
5. A. K. Singh, "Foundation of Digital Electronics & Logic Design," New Age Int. Publishers.
6. Subrata Ghosal, "Digital Electronics," Cengage publication, 2nd edition, 2018

Course outcomes:

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

1. Design and analyze combinational logic circuits.
 2. Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder
 3. Design & analyze synchronous sequential logic circuits
 4. Analyze various logic families.
 5. Design ADC and DAC and implement in amplifier, integrator, etc.
-

KEC303	Network Analysis and Synthesis	3L:0T:0P	3 Credits
---------------	---------------------------------------	-----------------	------------------

Unit	Topics	Lectures
I	Node and mesh analysis, matrix approach of network containing voltage & current sources and reactances, source transformation and duality.	8
II	Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power transfer, compensation and Tellegen's theorem as applied to A.C. circuits.	8
III	Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.	8
IV	Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.	8
V	Transient behaviour, concept of complex frequency, driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and two four port network and interconnections, behaviour of series and parallel resonant circuits, introduction to band pass, low pass, high pass and band reject filters.	8

Text/Reference Books

1. Franklin F. Kuo, "Network Analysis and Synthesis," Wiley India Education, 2nd Ed., 2006.
2. Van, Valkenburg, "Network analysis," Pearson, 2019.
3. Sudhakar, A., Shyammoan, S. P., "Circuits and Network," Tata McGraw-Hill New Delhi, 1994.
4. A William Hayt, "Engineering Circuit Analysis," 8th Edition, McGraw-Hill Education.
5. A. Anand Kumar, "Network Analysis and Synthesis," PHI publication, 2019.

Course Outcomes:

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

1. Understand basics electrical circuits with nodal and mesh analysis.
 2. Appreciate electrical network theorems.
 3. Apply Laplace transform for steady state and transient analysis.
 4. Determine different network functions.
 5. Appreciate the frequency domain techniques.
-

KEC351	Electronic Devices Lab	0L:0T:2P	1 Credits
---------------	-------------------------------	-----------------	------------------

SUGGESTIVE LIST OF EXPERIMENTS

1. **Study of Lab Equipment 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 V_{rms} , V_{dc} , and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of Zener diode, graphical measurement of forward and reverse resistance.
5. **Characteristics of Photo diode:** V-I characteristics of photo diode, graphical measurement of forward and reverse resistance.
6. **Characteristics of Solar cell:** V-I characteristics of solar cell, graphical measurement of forward and reverse resistance.
7. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
8. **Characteristic of BJT:** BJT in CE configuration- graphical measurement of h-parameters from input and output characteristics. Measurement of A_v , A_i , R_o and R_i of CE amplifier with potential divider biasing.
9. **Field Effect Transistors:** Single stage common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Metal Oxide Semiconductor Field Effect Transistors:** Single stage MOSFET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

Course outcomes:

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

1. Understand working of basic electronics lab equipment.
 2. Understand working of PN junction diode and its applications.
 3. Understand characteristics of Zener diode.
 4. Design a voltage regulator using Zener diode.
 5. Understand working of BJT, FET, MOSFET and apply the concept in designing of amplifiers.
-

KEC352	Digital System Design Lab	0L:0T:2P	1 Credits
---------------	----------------------------------	-----------------	------------------

SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuits and other components.

Course outcomes:

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

1. Design and analyze combinational logic circuits.
 2. Design & analyze modular combinational circuits with MUX/DEMUX, decoder, encoder.
 3. Design & analyze synchronous sequential logic circuits.
 4. Design & build mini project using digital ICs.
-

KEC353	Network Analysis and Synthesis Lab	0L:0T:2P	1 Credits
---------------	---	-----------------	------------------

SUGGESTIVE LIST OF EXPERIMENTS

1. Verification of Kirchhoff's laws.
2. Verification of Superposition theorem.
3. Verification of Thevenin's Theorem and Maximum power transfer theorem.
4. Verification of Tallegen's theorem.
5. Measurement of power and power factor in a single phase AC series inductive circuit and study improvement of power factor using capacitor.
6. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
7. Determination of parameters of AC single phase series RLC circuit.
8. To find poles and zeros of immittance function.
9. Design and find cut-off frequency of low pass and high pass filters.
10. Design and find the pass band frequencies of band pass filters.
11. Design and find the stop band frequencies of band reject filters.

Course Outcomes:

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

1. Understand basics of electrical circuits with nodal and mesh analysis.
 2. Appreciate electrical network theorems.
 3. Analyse RLC circuits.
 4. Determine the stability of an electrical circuit.
 5. Design network filters.
-

Semester-IV

KEC401	Communication Engineering	3L:0T:0P	3 Credits
---------------	----------------------------------	-----------------	------------------

Unit	Topics	Lectures
I	Review of signals and systems, frequency domain representation of signals, principles of amplitude modulation systems- DSB, SSB and VSB modulations.	8
II	Angle modulation, representation of FM and PM signals, spectral characteristics of angle modulated signals.	8
III	Review of probability and random process, Gaussian and white noise characteristics, noise in amplitude modulation systems, noise in frequency modulation systems, pre-emphasis and de-emphasis, threshold effect in angle modulation.	8
IV	Pulse modulation, sampling process, pulse amplitude and pulse code modulation (PCM), differential pulse code modulation. Delta modulation, noise considerations in PCM, time division multiplexing, digital multiplexers.	8
V	Digital modulation schemes- phase shift keying, frequency shift keying, quadrature amplitude modulation, continuous phase modulation and minimum shift keying.	8

Text/Reference Books:

1. Haykin S., "Communications Systems," John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering," Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems," Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering," John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication," Kluwer Academic Publishers, 2004.
6. Proakis J.G., "Digital Communications,' 4th Edition, McGraw Hill, 2000.
7. Abhay Gandhi, "Analog and Digital Communication," Cengage publication, 2015.

Course Outcomes:

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

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth.
 2. Analyze the behavior of a communication system in presence of noise.
 3. Investigate pulsed modulation system and analyze their system performance.
 4. Investigate various multiplexing techniques.
 5. Analyze different digital modulation schemes and compute the bit error performance.
-

KEC402	Analog Circuits	3L:1T:0P	4 Credits
---------------	------------------------	-----------------	------------------

Unit	Topics	Lectures
I	Diode circuits, amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	8
II	High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier, various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues, feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.	8
III	Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.	8
IV	Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, Op-Amp design: Design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	8
V	Op-Amp applications: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass, band pass and band stop, design guidelines.	8

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, "Introduction to Operational Amplifier theory and applications," Mc Graw Hill, 1992.
2. J. Millman and A. Grabel, "Microelectronics," 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics," 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, "Microelectronic Circuits," Saunder's College11 Publishing, 4th edition.
5. Paul R. Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits," John Wiley, 3rd edition.
6. Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.

Course Outcomes:

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

1. Understand the characteristics of diodes and transistors.
2. Design and analyze various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design LPF, HPF, BPF, BSF.

KEC403	Signal System	3L:1T:0P	4 Credits
---------------	----------------------	-----------------	------------------

Unit	Topics	Lectures
I	Signals and systems as seen in everyday life, and in various branches of engineering and science, energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals, system properties: linearity, additivity and homogeneity, shift-invariance, causality, stability, realizability.	8
II	Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, characterization of causality and stability of linear shift invariant systems, system representation through differential equations and difference equations, Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response	8
III	Fourier series representation, Fourier transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality, Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier transform (DFT), Parseval's Theorem, the idea of signal space and orthogonal bases, the Laplace transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behaviour.	8
IV	The z-Transform for discrete time signals and systems-Eigen functions, region of convergence, z-domain analysis.	8
V	The sampling theorem and its implications- spectra of sampled signals, reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on, aliasing and its effects, relation between continuous and discrete time systems.	8

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems," Pearson, 2015.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete," 4th edition, Prentice Hall, 1998.
3. B.P. Lathi, "Signal Processing and Linear Systems," Oxford University Press, 1998.
4. Douglas K. Lindner, "Introduction to Signals and Systems," McGraw Hill International Edition: 1999.
5. Simon Haykin, Barry van Veen, "Signals and Systems," John Wiley and Sons (Asia) Private Limited, 1998.
6. V. Krishnaveni, A. Rajeswari, "Signals and Systems," Wiley India Private Limited, 2012.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems," John Wiley and Sons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB," TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems," TMH New Delhi, 2001.
10. A. Anand Kumar, "Signals and Systems," PHI 3rd edition, 2018.
11. D. Ganesh Rao, K.N. Hari Bhat, K. Anitha Sheela, "Signal, Systems, and Stochastic Processes," Cengage publication, 2018.

Course outcomes:

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

1. Analyze different types of signals.
 2. Analyze linear shift-invariant (LSI) systems.
 3. Represent continuous and discrete systems in time and frequency domain using Fourier series and transform.
 4. Analyze discrete time signals in z-domain.
 5. Study sampling and reconstruction of a signal.
-

KEC451	Communication Engineering Lab	0L:0T:2P	1 Credits
---------------	--------------------------------------	-----------------	------------------

SUGGESTIVE LIST OF EXPERIMENTS

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector.
3. To study frequency modulation and determine its modulation factor.
4. To study sampling and reconstruction of pulse amplitude modulation system.
5. To study pulse amplitude modulation.
 - a) Using switching method
 - b) By sample and hold circuit
6. To demodulate the obtained PAM signal by 2nd order LPF.
7. To study pulse width modulation and pulse position modulation.
8. To study pulse code modulation and demodulation technique.
9. To study delta modulation and demodulation technique.
10. To construct a square wave with the help of fundamental frequency and its harmonic component.
11. Study of amplitude shift keying modulator and demodulator.
12. Study of frequency shift keying modulator and demodulator.
13. Study of phase shift keying modulator and demodulator.
14. Study of single bit error detection and correction using hamming code.
15. Study of quadrature phase shift keying modulator and demodulator.
16. To simulate differential phase shift keying technique using MATLAB software.
17. To simulate M-ary Phase shift keying technique using MATLAB software (8PSK, 16PSK) and perform BER calculations.
18. Design a front end BPSK modulator and demodulator.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze and compare different analog modulation schemes for their modulation factor and power.
 2. Study pulse amplitude modulation.
 3. Analyze different digital modulation schemes and can compute the bit error performance.
 4. Study and simulate the Phase shift keying.
 5. Design a front end BPSK modulator and demodulator.
-

KEC452	Analog Circuit Lab	0L:0T:2P	1 Credits
---------------	---------------------------	-----------------	------------------

SUGGESTIVE LIST OF EXPERIMENTS

1. Characteristic of BJT: Study of BJT in various configurations (such as CE/CS, CB/CG, CC/CD).
2. BJT in CE configuration: Graphical measurement of h-parameters from input and output characteristics, measurement of A_v , A_i , R_o and R_i of CE amplifier with potential divider biasing.
3. Study of Multi-stage amplifiers: Frequency response of single stage and multistage amplifiers.
4. Feedback topologies: Study of voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.
5. Measurement of Op-Amp parameters: Common mode gain, differential mode gain, CMRR, slew rate.
6. Applications of Op-Amp: Op-Amp as summing amplifier, difference amplifier, integrator and differentiator.
7. Field effect transistors: Single stage common source FET amplifier –plot of gain in dB vs frequency, measurement of bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
8. Oscillators: Study of sinusoidal oscillators- RC oscillators (phase shift, Wien bridge etc.).
9. Study of LC oscillators (Hartley, Colpitt, Clapp etc.),
10. Study of non-sinusoidal oscillators.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.
12. ADC/DAC: Design and study of Analog to Digital Converter.
13. Design and study of Digital to Analog Converter.

Course Outcome

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

1. Understand the characteristics of transistors.
 2. Design and analyze various configurations of amplifier circuits.
 3. Design sinusoidal and non-sinusoidal oscillators.
 4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
 5. Design ADC and DAC.
-

KEC453	Signal System Lab	0L:0T:2P	1 Credits
---------------	--------------------------	-----------------	------------------

SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to MATLAB
 - a. To define and use variables and functions in MATLAB.
 - b. To define and use Vectors and Matrices in MATLAB.
 - c. To study various MATLAB arithmetic operators and mathematical functions.
 - d. To create and use m-files.
2. Basic plotting of signals
 - a. To study various MATLAB commands for creating two and three dimensional plots.
 - b. Write a MATLAB program to plot the following continuous time and discrete time signals.
 - i. Step Function
 - ii. Impulse Function
 - iii. Exponential Function
 - iv. Ramp Function
 - v. Sine Function
3. Time and Amplitude transformations
Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
 - a. Write a MATLAB program to compute autocorrelation of a sequence $x(n)$ and verify the property.
 - b. Write a MATLAB program to compute cross-correlation of sequences $x(n)$ and $y(n)$ and verify the property.
6. Fourier Series and Gibbs Phenomenon
 - a. To calculate Fourier series coefficients associated with Square Wave.
 - b. To Sum the first 10 terms and plot the Fourier series as a function of time.
 - c. To Sum the first 50 terms and plot the Fourier series as a function of time.
7. Calculating transforms using MATLAB
 - a. Calculate and plot Fourier transform of a given signal.
 - b. Calculate and plot Z-transform of a given signal.
8. Impulse response and Step response of a given system
 - a. Write a MATLAB program to find the impulse response and step response of a system from its difference equation.
 - b. Compute and plot the response of a given system to a given input.
9. Pole-zero diagram and bode diagram
 - a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function.
 - b. Write a MATLAB program to find, bode diagram of a given system from the given system function.
10. Frequency response of a system
Write a MATLAB program to plot magnitude and phase response of a given system.

11. Checking linearity/non-linearity of a system using SIMULINK
 - a. Build a system that amplifies a sine wave by a factor of two.
 - b. Test the linearity of this system using SIMULINK.

Course outcomes:

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

1. Understand the basics operation of MATLAB.
 2. Analysis the time domain and frequency domain signals.
 3. Implement the concept of Fourier series and Fourier transforms.
 4. Find the stability of system using pole-zero diagrams and bode diagram.
 5. Design frequency response of the system.
-

**BUNDELKHAND INSTITUTE OF ENGINEERING
& TECHNOLOGY, JHANSI**



EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. THIRD YEAR

ELECTRONICS AND COMMUNICATION ENGINEERING

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session: 2020-21]

ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech. V Semester

Electronics and Communication Engineering

S. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KEC-501	Integrated Circuits	3	1	0	30	20	50		100		150	4
2	KEC-502	Microprocessor & Microcontroller	3	1	0	30	20	50		100		150	4
3	KEC-503	Digital Signal Processing	3	1	0	30	20	50		100		150	4
4	KEC-051-054	Department Elective-I	3	0	0	30	20	50		100		150	3
5	KEC-055-058	Department Elective-II	3	0	0	30	20	50		100		150	3
6	KEC-551	Integrated Circuits Lab	0	0	2				25		25	50	1
7	KEC-552	Microprocessor & Microcontroller Lab	0	0	2				25		25	50	1
8	KEC-553	Digital Signal Processing Lab	0	0	2				25		25	50	1
9	KEC-554	Mini Project/Internship **	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			NC
11		MOOCs (Essential for Hons. Degree)											
		Total										950	22

**The Mini Project or Internship (4weeks) conducted during summer break after IV Semester and will be assessed during Vth Semester.

Course Code

Course Title

Department Elective-I

KEC-051	Computer Architecture and Organization
KEC-052	Industrial Electronics
KEC-053	VLSI Technology
KEC-054	Advance Digital Design using Verilog

Department Elective-II

KEC-055	Electronics Switching
KEC-056	Advance Semiconductor Device
KEC-057	Electronic Instrumentation and Measurements
KEC-058	Optical Communication

B.Tech. VI Semester Electronics and Communication Engineering

S. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KEC-601	Digital Communication	3	1	0	30	20	50		100		150	4
2	KEC-602	Control System	3	1	0	30	20	50		100		150	4
3	KEC-603	Electromagnetic Field Theory and Antenna	3	1	0	30	20	50		100		150	4
4	KEC-061- KEC-064	Department Elective–III	3	0	0	30	20	50		100		150	3
5		Open Elective-I	3	0	0	30	20	50		100		150	3
6	KEC-651	Digital Communication Lab	0	0	2				25		25	50	1
7	KEC-652	Control System Lab	0	0	2				25		25	50	1
8	KEC-653	Elective 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			NC
10		MOOCs (Essential for Hons. Degree)											
		Total										900	21

Course Code	Course Title
	Department Elective-III
KEC-061	Microcontroller & Embedded System
KEC-062	Satellite Communication
KEC-063	Data Communication Networks
KEC-064	Analog Signal Processing

Course Code

Elective Lab

KEC-653A	Measurement & Instrumentation Lab
KEC-653B	CAD for Electronics Lab
KEC-653C	Microcontroller & Embedded System Lab

**B.Tech 3rd Year
V Semester
Syllabus**

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-501	INTEGRATED CIRCUITS	3L:1T:0P	4 Credits
---------	---------------------	----------	-----------

Unit	Topics	Lectures
I	The 741 IC Op-Amp: General operational amplifier stages (bias circuit, the input stage, the second stage, the output stage, short circuit protection circuitry), device parameters, DC and AC analysis of input stage, second stage and output stage, gain, frequency response of 741, a simplified model, slew rate, relationship between f_t and slew rate.	8
II	Linear Applications of IC Op-Amps: Op-Amp based V-I and I-V converters, instrumentation amplifier, generalized impedance converter, simulation of inductors. Active Analog filters: Sallen Key second order filter, Designing of second order low pass and high pass Butterworth filter, Introduction to band pass and band stop filter, all pass active filters, KHN Filters. Introduction to design of higher order filters.	8
III	Frequency Compensation & Nonlinearity: Frequency Compensation, Compensation of two stage Op-Amps, Slewing in two stage Op-Amp. Nonlinearity of Differential Circuits, Effect of Negative feedback on Nonlinearity. Non-Linear Applications of IC Op-Amps: Basic Log–Anti Log amplifiers using diode and BJT, temperature compensated Log-Anti Log amplifiers using diode, peak detectors, sample and hold circuits. Op-amp as a comparator and zero crossing detector, astable multivibrator & monostable multivibrator. Generation of triangular waveforms, analog multipliers and their applications.	4 8
IV	Digital Integrated Circuit Design: An overview, CMOS logic gate circuits basic structure, CMOS realization of inverters, AND, OR, NAND and NOR gates. Latches and Flip flops: the latch, CMOS implementation of SR flip-flops, a simpler CMOS implementation of the clocked SR flip-flop, CMOS implementation of J-K flip-flops, D flip- flop circuits.	6
V	Integrated Circuit Timer: Timer IC 555 pin and functional block diagram, Monostable and Astable multivibrator using the 555 IC. Voltage Controlled Oscillator: VCO IC 566 pin and functional block diagram and applications. Phase Locked Loop (PLL): Basic principle of PLL, block diagram, working, Ex-OR gates and multipliers as phase detectors, applications of PLL.	6

Text Book:

1. Microelectronic Circuits, Sedra and Smith, 7th Edition, Oxford, 2017.
2. Behzad Razavi, Design of Analog CMOS Integrated Circuits, McGraw Hill
3. Gayakwad, "Op-Amps and Linear Integrated Circuits, 4th Edition, Pearson Education.
4. Sergio Franco, Design of Operational Amplifier and Analog Integrated Circuit, McGraw Hill
5. David A. Bell, "Operational Amplifiers and Linear IC's", Pearson Education,

Reference Books:

1. Franco, Analog Circuit Design: Discrete & Integrated, McGraw Hill, 1st Edition.
2. D. Roy Choudhary and Shail B. Jain, "Linear Integrated Circuits", New Age Publication
3. International Publications TB1 L.K. Maheshwari, Analog Electronics, PHI,2005
4. Salivahnan, Electronics Devices and Circuits, McGraw Hill , 3rd Edition, 2015
5. Millman and Halkias: Integrated Electronics, McGraw Hill, 2nd Edition, 2010.
6. TB2 L.K. Maheshwari and M.M.S. Anand, Laboratory Experiments & PSPICE Simulation in Analog Electronics Experiments, PHI, 2005.

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

1. Explain complete internal analysis of Op-Amp 741-IC.
2. Examine and design Op-Amp based circuits and basic components of ICs such as various types of filter.
3. Implement the concept of Op-Amp to design Op-Amp based non-linear applications and wave-shaping circuits.
4. Analyse and design basic digital IC circuits using CMOS technology.
5. Describe the functioning of application specific ICs such as 555 timer, VCO IC 566 and PLL.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-502	MICROPROCESSOR & MICROCONTROLLER	3L:1T:0P	4 Credits
----------------	---	-----------------	------------------

Unit	Topics	Lectures
I	Introduction to Microprocessor: Microprocessor architecture and its operations, Memory, Input & output devices, The 8085 MPU- architecture, Pins and signals, Timing Diagrams, Logic devices for interfacing, Memory interfacing, Interfacing output displays, Interfacing input devices, Memory mapped I/O.	8
II	Basic Programming concepts: , Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing. Additional data transfer and 16 bit arithmetic instruction, Logic operation: rotate, compare, counter and time delays, 8085 Interrupts.	8
III	16-bit Microprocessors (8086): Architecture, Pin Description, Physical address, segmentation, memory organization, Addressing modes. Peripheral Devices: 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254 programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.	8
IV	8051 Microcontroller Basics: Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051. Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM. 8051 Addressing Modes.	8
V	Assembly programming and instruction of 8051: Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming. Programming 8051 Timers. Serial Port Programming, Interrupts Programming, Comparison of Microprocessor, Microcontroller, PIC and ARM processors and their application areas. Interfacing: LCD & Keyboard Interfacing, ADC, DAC & Sensor Interfacing, External Memory Interface, Stepper Motor and Waveform generation.	8

Text Books:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 6th Edition, Penram International Publication (India) Pvt. Ltd., 2013
2. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D., "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson, 2nd Edition, 2006
3. Senthil Kumar Saravanan, Jeevanathan, Microprocessor and Microcontrollers, Oxford, 2010
4. D. V. Hall : Microprocessors Interfacing, , McGraw 3rd Edition
5. Fundamental of Microprocessor and Microcontrollers, B. RAM, Dhanpat Rai Publication
6. Soumitra Kumar Mandal, Microprocessor and Microcontrollers Architecture Programming and Interfacing using 8085, 8086 and 8051, McGraw Hill

Reference Books:

1. Kenneth L. Short, "Microprocessors and programmed Logic", 2nd Ed, Pearson Education Inc., 2003
2. Barry B. Brey, "The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, Pentium IV, Architecture, Programming & Interfacing", Eighth Edition, Pearson Prentice Hall, 2009.
3. Shah Satish, "8051 Microcontrollers MCS 51 Family and its variants", Oxford, 2010

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

1. Demonstrate the basic architecture of 8085.
2. Illustrate the programming model of microprocessors & write program using 8085 microprocessor.
3. Demonstrate the basics of 8086 Microprocessor and interface different external Peripheral Devices like timer, USART etc. with Microprocessor (8085/8086).
4. Compare Microprocessors & Microcontrollers, and comprehend the architecture of 8051 microcontroller
5. Illustrate the programming model of 8051 and implement them to design projects on real time problems

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-503	DIGITAL SIGNAL PROCESSING	3L:1T:0P	4 Credits
----------------	----------------------------------	-----------------	------------------

Unit	Topics	Lectures
I	<p>Introduction to Digital Signal Processing: Basic elements of digital signal processing, advantages and disadvantages of digital signal processing, Technology used for DSP.</p> <p>Realization of Digital Systems: Introduction- basic building blocks to represent a digital system, recursive and non-recursive systems, basic structures of a digital system: Canonic and Non-Canonic structures.</p> <p>IIR Filter Realization: Direct form, cascade realization, parallel form realization, Ladder structures- continued fraction expansion of $H(z)$, example of continued fraction, realization of a ladder structure, design examples.</p> <p>FIR Filter Realization: Direct, Cascade, FIR Linear Phase Realization and design examples.</p>	8
II	<p>Infinite Impulse Response Digital (IIR) Filter Design: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters, Frequency Transformations.</p>	6
III	<p>Finite Impulse Response Filter (FIR) Design: Windowing and the Rectangular Window, Gibb's phenomenon, Other Commonly Used Windows (Hamming, Hanning, Bartlett, Blackmann, Kaiser), Examples of Filter Designs Using Windows.</p> <p>Finite Word length effects in digital filters: Coefficient quantization error, Quantization noise – truncation and rounding, Limit cycle oscillations-dead band effects.</p>	4 2
IV	<p>Discrete Fourier Transform: Concept and relations for DFT/IDFT, Twiddle factors and their properties, computational burden on direct DFT, DFT/IDFT as linear transformations, DFT/IDFT matrices, computation of DFT/IDFT by matrix method, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences – Overlap-Save and Overlap-Add methods with examples.</p> <p>Fast Fourier Transform: Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations with examples.</p>	6 6
V	<p>Multirate Digital Signal Processing (MDSP): Introduction, Decimation, Interpolation, Sampling rate conversion: Single and Multistage, applications of MDSP- Subband Coding of Speech signals, Quadrature mirror filters, Advantages of MDSP.</p> <p>Adaptive Filter: Introduction & Example of adaptive Filter, The window LMS Algorithm, Recursive Least Square Algorithm. The Forward-Backward Lattice and Gradient Adaptive Lattice Method.</p> <p>Digital Signal Processors: Introduction, Architecture, Features, Addressing Formats, Functional modes. Introduction to Commercial Digital Signal Processors</p>	4 4 2

Text Books:

1. John G Prokias, Dimitris G Manolakis, Digital Signal Processing. Pearson , 4th Edition, 2007
2. S. Salivahanan, Digital Signal Processing, McGraw Hill, 4th Edition 2017.
3. Johnny R. Johnson, Digital Signal Processing, PHI Learning Pvt Ltd., 2009.

Reference Books:

1. Oppenheim & Schafer, Digital Signal Processing. Pearson Education 2015
2. S.K. Mitra, 'Digital Signal Processing–A Computer Based Approach, McGraw Hill, 4th Edition.

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

1. Design and describe different types of realizations of digital systems (IIR and FIR) and their utilities.
2. Select design parameters of analog IIR digital filters (Butterworth and Chebyshev filters) and implement various methods such as impulse invariant transformation and bilinear transformation of conversion of analog to digital filters.
3. Design FIR filter using various types of window functions.
4. Define the principle of discrete Fourier transform & its various properties and concept of circular and linear convolution. Also, students will be able to define and implement FFT i.e. a fast computation method of DFT.
5. Define the concept of decimation and interpolation. Also, they will be able to implement it in various practical applications.

KEC-551	INTEGRATED CIRCUITS LAB	0L:0T:2P	1 Credit
---------	-------------------------	----------	----------

SUGGESTIVE LIST OF EXPERIMENTS:

1. Design the following using Op-Amp: (*Through Virtual Lab Link 1*)
 - a) A unity gain amplifier.
 - b) An inverting amplifier with a gain of “A”.
 - c) A non-inverting amplifier with a gain of “A”
2. Study and design Log and antilog amplifiers.
3. Voltage to current and current to voltage convertors.
4. Second order filters using operational amplifier for: (*Through Virtual Lab Link 1*)
 - a) Low pass filter of cutoff frequency 1 KHz.
 - b) High pass filter of frequency 12 KHz.
5. Realization of Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.
6. Study and design voltage comparator and zero crossing detectors.
7. Function generator using operational amplifier (sine, triangular & square wave).
8. Design and construct astable multivibrator using IC 555 and
 - a) Plot the output waveform
 - b) Measure the frequency of oscillation (*Through Virtual Lab Link 2*)
9. Design and construct a monostable multivibrator using IC 555 and
 - a) Plot the output waveform
 - b) Measure the time delay (*Through Virtual Lab Link 2*)
10. Implement Schmitt Trigger Circuit using IC 555. (*Through Virtual Lab Link 2*)
11. Implement voltage-controlled oscillator using IC566 and plot the waveform. (*Through Virtual Lab Link 2*)
12. Study and design ramp generator using IC 566.

Virtual Lab Link:

1. <http://vlabs.iitkgp.ernet.in/be/exp17/index.html>
2. <http://hecoep.vlabs.ac.in/Experiment8/Theory.html?domain=ElectronicsandCommunications&lab=Hybrid%20Electronics%20Lab>

Available on: <http://www.vlab.co.in/broad-area-electronics-and-communications>

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

1. Design different non-linear applications of operational amplifiers such as log, antilog amplifiers and voltage comparators.
2. Explain and design different linear applications of operational amplifiers such as filters.
3. Demonstrate the function of waveforms generator using op-Amp.
4. Construct multivibrator and oscillator circuits using IC555 and IC566 and perform measurements of frequency and time.
5. Design and practically demonstrate the applications based on IC555 and IC566.

KEC-552	MICROPROCESSOR & MICROCONTROLLER LAB	0L:0T:2P	1 Credit
---------	---	----------	----------

SUGGESTIVE LIST OF EXPERIMENTS:

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers. (*Through Virtual Lab Link*)
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers. (*Through Virtual Lab Link*)
3. To perform multiplication and division of two 8 bit numbers using 8085. (*Through Virtual Lab Link*)
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program using 8086 to arrange an array of data in ascending and descending order. (*Through Virtual Lab Link*)
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8086 instruction set.
7. To convert given Hexadecimal number into its equivalent BCD number and vice versa using 8086 instruction set.
8. To interface 8253 programmable interval timer and verify the operation of 8253 in six different modes.
9. To write a program to initiate 8251 and to check the transmission and reception of character.
10. Serial communication between two 8085 through RS-232 C port.
11. Write a program of Flashing LED connected to port 1 of the 8051 Micro Controller
12. Write a program to generate 10 kHz square wave using 8051.
13. Write a program to show the use of INT0 and INT1 of 8051.
14. Write a program for temperature & to display on intelligent LCD display.
15. Interfacing of Stepper motor to 8051.
16. Interfacing of ADC to 8051.

Virtual Lab Link: http://vlabs.iitb.ac.in/vlabs-dev/labs_local/microprocessor/labs/explist.php

Available on: <http://www.vlab.co.in/broad-area-electronics-and-communications>

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

1. Use techniques, skills, modern engineering tools, instrumentation and software/hardware appropriately to list and demonstrate arithmetic and logical operations on 8 bit data using microprocessor 8085.
2. Examine 8085 & 8086 microprocessor and its interfacing with peripheral devices.
3. State various conversion techniques using 8085 & 8086 and generate waveforms using 8085.
4. Implement programming concept of 8051 Microcontroller.
5. Design concepts to Interface peripheral devices with Microcontroller so as to design Microcontroller based projects.

KEC-553	DIGITAL SIGNAL PROCESSING LAB	0L:0T:2P	1 Credit
---------	-------------------------------	----------	----------

SUGGESTIVE LIST OF EXPERIMENTS:

1. Introduction to MATLAB and or Open Source Software, Scilab (Using Spoken Tutorial MOOCs). Hardware (Using TI/Analog devices/Motorola/Equivalent DSP processors).
2. Write a Program for the generation of basic signals such as unit impulse, unit step, ramp, exponential, sinusoidal and cosine.
3. Implement IIR Butterworth analog Low Pass for a 4 KHz cut off frequency.
4. Verify Blackman and Hamming windowing techniques.
5. Evaluate 4-point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3; 0$ elsewhere.
6. Verify Linear convolution of two sequences using FFT
7. Verify Circular Convolution of two sequences using FFT.
8. To verify FFT as sample interpolator.
9. To implement Tone Generation.
10. To implement floating point arithmetic.

11. To study Open code composer studio and DSP Processors and architecture of TMS320C6713 DSP processor. Perform all Experiment 1 to 10
12. To implement IIR and FIR filter using DSP TMS320C6713 Processor.

B VIRTUAL Lab by NME-ICT available at: (*Through Virtual Lab*)

Study of Discrete Fourier Transform (DFT) and its inverse.

Study of FIR filter design using window method: Lowpass and highpass filter.

Study of FIR filter design using window method: Bandpass and Bandstop filter.

Study of Infinite Impulse Response (IIR) filter.

Virtual Lab Link: <http://vlabs.iitkgp.ernet.in/dsp/index.html#>
<http://vlabs.iitkgp.ernet.in/dsp/>

Available on: <http://www.vlab.co.in/broad-area-electronics-and-communications>

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (<http://spoken-tutorial.org/>)

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

1. Create and visualize various discrete/digital signals using MATLAB/Scilab.
2. Implement and test the basic operations of Signal processing.
3. Examine and analyse the spectral parameters of window functions.
4. Design IIR and FIR filters for band pass, band stop, low pass and high pass filters.
5. Design the signal processing algorithms using MATLAB/Scilab.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-051	COMPUTER ARCHITECTURE AND ORGANIZATION	3L:0T:0P	3 Credits
----------------	---	-----------------	------------------

Unit	Topics	Lectures
I	Introduction to Design Methodology: System Design – System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor Basics: CPU Organization- Fundamentals, Additional features. Data Representation - Basic formats, Fixed point numbers, Floating point numbers. Instruction Sets- Formats, Types and programming considerations.	8
III	Datapath Design: Fixed point arithmetic - Addition and Subtraction, Multiplication and Division, Arithmetic Logic Unit-Combinational ALUs and Sequential ALUs. Floating point arithmetic.	8
IV	Control Design: basic concepts- introduction, hardwired control, Microprogrammed control- Introduction, multiplier control unit, CPU control unit, Pipeline Control- Instruction Pipelines, Pipeline performance and Superscalar Processing. Data Hazards, Control Hazards, Advanced Concepts in pipeline Processing	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches - Main features, Address Mapping, Structure versus Performance, System Organization: Communication methods- Basic Concepts, Bus Control. IO and System- Control Programmed IO, IO Processor and Operating System. Parallel Processing & Fault Tolerance. Introduction to HDL Programming (VHDL & Verilog)	8

Text Book:

1. John P Hayes "Computer Architecture and Organization", 3rd Edition McGraw Hill Publication. (2017)
2. M Morris Mano, "Computer System Architecture", 3rd Edition, Pearson. (2017)

Reference Books:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization and Embedded Systems", McGraw Hill Publication. (2009)
2. Samir Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Pearson Education Asia, 2nd Edition
3. David A. Patterson and John L. Hennessy, Computer Organization & Design, Elsevier, 5th Edition, 2017

Course Outcomes:

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

1. Discuss about the basic concepts of system design methodology and processor level design.
2. Explain the basics of processor and basic formats of data representation.
3. Perform fixed and floating point arithmetic operations.
4. Describe the basic concepts of control design and pipeline performance.
5. Explain the architecture and functionality of central processing unit.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-052	INDUSTRIAL ELECTRONICS	3L:0T:0P	3 Credits
----------------	-------------------------------	-----------------	------------------

Unit	Topics	Lectures
I	Introduction to Power Switching Devices: Description of working & constructional features, Switching Characteristics, ratings and Applications of Power Transistor, Power MOSFET, SCR, DIAC, TRIAC, IGBT and MCT.	8
II	SCR Performance and Applications: Protection of SCR, SCR Triggering and Commutation Circuits/Methods, Series and Parallel operation of SCR, two transistor model of SCR, , Describe Construction & Working of Opto- Isolators, Opto-TRIAC, Opto-SCR.	8
III	Power Converter Performance & Applications: Introduction to Basic Power Converters Architecture - Single Phase, there performance under different types of Loads, Average/RMS output Voltage & Current, Freewheeling Diode, Feedback Diode, State Relay using Opto SCR, SMPS and UPS functioning through Block Diagrams.	8
IV	Timers & Delay Elements, High Frequency Power Heating, Sensor and Actuators: RC Base Constant Timers, Timer Circuits using SCR, IC-555, Programmable Timer and their Industrial Applications, Induction Heating and Dielectric Heating System and Their Applications, Sensors, Transducers, and Transmitters for Measurement, Control & Monitoring : Thermoresistive Transducer, Photoconductive Transducers, Pressure Transducers, Flow Transducers, Level Sensors, Speed Sensing, Vibration Transducers, Variable-Frequency Drives, Stepper Motors and Servomotor Drives.	8
V	Automation and Control: Data Communications for Industrial Electronics, Telemetry, SCADA & Automation, AC & DC Drives, Voltage & Power Factor Control through Solid State Devices, Soft Switching, Industrial Robots.	8

Text Books:

1. M.H. Rashid, "Power Electronics: Circuits, Devices & Applications", Pearson, 4rd Edition, 2013.
2. P.C.Sen, "Power Electronics", McGraw Hill, 2nd Ed, 2017
3. V.R. Moorthy, "Power Electronics: Devices, Circuits and Industrial Applications" Oxford University Press, 2007.
4. P.S. Bhimbra, "Power Electronics", Khanna Publishers.

Reference Books:

1. B. Paul, Industrial Electronic and Control, Prentice Hall of India Private Limited (2004).
2. Ned Mohan, T.M. Undeland and W.P. Robbins, "Power Electronics: Converters, Applications and Design", Wiley India Ltd, 2008.
3. Thomas E. Kissell, Industrial Electronics: Applications for Programmable Controllers, Instrumentation and Process Control, and Electrical Machines and Motor Controls, 3rd edition, 2003, Prentice Hall.
4. Chakrabarti & Rai, "Fundamentals of Power Electronics & Drives" Dhanpat Rai & Sons.
5. S.N.Singh, "A Text Book of Power Electronics" Dhanpat Rai & Sons.
6. G.K. Dubey, Power Semiconductor Controlled Drives, Prentice Hall inc. (1989).

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

1. Describe the characteristics, operation of power switching devices and identify their ratings and applications.
2. Recognize the requirement of SCR Protection and describe the Functioning of SCR.
3. Analyze and design Power Converter based on SCR for various Industrial Applications.
4. Explain High Frequency Heating Systems, Timers, Relevant Sensors & Actuator and their application in industrial setting.
5. Explain and apply Data Communication, Telemetry & SCADA System in industrial applications.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-053	VLSI TECHNOLOGY	3L:0T:0P	3 Credits
----------------	------------------------	-----------------	------------------

Unit	Topics	Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits, Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Wafer Cleaning Technology - Basic Concepts, Wet cleaning, Dry cleaning	8
II	Epitaxy: Vapor-Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation. Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties.	8
III	Lithography: Optical Lithography, Electron beam lithography, Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes of Polysilicon, Silicon Dioxide, Silicon Nitride.	8
IV	Diffusion: Models of diffusion in solids, Fick's 1-Dimensional diffusion equation, Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources, Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.	8
V	Metallization: Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies, CMOS fabrication steps.	8

Text Books:

1. S. M. Sze, "VLSI Technology", McGraw Hill Publication, 2nd Edition 2017
2. S.K. Ghandhi, "VLSI Fabrication Principles", Willy-India Pvt. Ltd, 2008
3. J. D. Plummer, M. D. Deal and Peter B. Griffin, "Silicon VLSI Technology: Fundamentals, Practice and Modeling", Pearson Education, 2009
4. Stephen A. Campbell, "Fabrication Engineering at the Micro and Nano scale", Oxford University Press, 2013
5. R. S. Muller and T. I. Kamins, Device Electronics for Integrated Circuits, 3rd Edition, Willy, New York.
6. Paolo Antognetti and Giuseppe Massobrio, Semiconductor Device Modelling with SPICE, McGraw Hill.

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

1. Interpret the basics of crystal growth, wafer preparation and wafer cleaning.
2. Evaluate the process of Epitaxy and oxidation.
3. Differentiate the lithography, etching and deposition process.
4. Analyze the process of diffusion and ion implantation
5. Express the basic process involved in metallization and packaging.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC 054	ADVANCED DIGITAL DESIGN USING VERILOG	3L:0T:0P	3 Credits
---------	---------------------------------------	----------	-----------

Unit	Topic	Lectures
I	Introduction to Mixed Logic, Logic Representation and Minimization with cost, Multiple output minimization, Entered Variable K- Map including don't care handling, XOR Pattern Handling.	8
II	Combinational Circuit Design, Multiplexers, Decoders, Encoders, Code Comparators, Adders, Subtractors, Multipliers, Introduction to Verilog, Behavioral and Structural specification of logic circuits, Boolean function implementation using Verilog, Timing Analysis, Hazard Detection and Elimination	8
III	Synchronous Sequential Circuits Design, Mapping Algorithm, Synchronous State Machines, ASM Charts, Asynchronous Sequential Circuit Design, Races, Multi-level minimization and optimization.	8
IV	Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis in combinational and sequential systems, Path Sensitization method, Boolean Difference Method, Initial State Method.	8
V	Study of programmable logic families, PLD, CPLD, FPGA, ASIC, PLA, Architectures, Design of Combinational and sequential circuits using CPLD and FPGA, Design Examples.	8

Text Books:

1. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL, 2nd Edition", Pearson Education, 2017
2. Richard F. Tindler, "Engineering Digital Design", Academic Press.
3. Stephen Brown and Zvonko Vranesiv, "Fundamental of Digital Logic with Verilog Design", McGraw Hill.
4. Neil H.E. Weste, "CMOS VLSI Design: A Circuits and Systems Perspective, 4th Edition", Pearson Education, 2015
5. Navabi Zainalabedin, Verilog Digital System Design, 2nd Edition, McGraw Hill,
6. Morris Mano, Digital Design, 6th Edition, , 6th Edition, Pearson Publication

Reference Books:

1. John Williams, "Digital VLSI Design with Verilog", Springer Publication..
2. Samuel C. Lee, "Digital Circuit and Logic Design", PHI India Ltd.
3. Parag K. Lala, "Digital System Design Using PLDs", PHI India Ltd.
4. Alexander Miczo, "Digital Logic Testing and Simulation", 2nd Edition Wiley
5. R.Jacob.Baker, Harry.W.Li, David.Boyce, "CMOS Circuit Design Layout and Simulation.

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

1. Describe mixed logic circuits and their implementation.
2. Implement combinational circuits using mixed logic and Verilog.
3. Design sequential circuits using mixed logic and Verilog with mapping of Algorithm.
4. Understand faults and its elimination in sequential and combinational circuits.
5. Understand the working of programmable logic families.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-055	ELECTRONIC SWITCHING	3L:0T:0P	3 Credits
---------	----------------------	----------	-----------

Unit	Topics	Lectures
I	Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register translator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.	8
II	Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems, Digital Switching in an Analog Environment.	8
III	Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems	8
IV	Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signaling: Introduction, Customer line signaling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter-register signalling, Common-channel signaling principles, CCITT signaling system no. 6 and 7, Digital customer line signaling.	8
V	Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space Memory switch, Banyan Network Switch, Close Networks).	8

Text Book:

1. T. Viswanathan and M. Bhatnagar, Telecommunication Switching Systems and Networks, 2nd Ed., Prentice-Hall, 2018
2. J.E. Flood, "Telecommunication Switching, Traffic and Networks", Pearson Education 2016.
3. John C. Bellamy, "Digital Telephony", John Wiley, 3rd Edition, 2006
4. Roger L. Freeman, Telecommunication System Engineering, 4th Edition, John Wiley & Sons, Inc., 2004.

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

1. Describe the fundamentals of circuit switching and distinguish complex telephone systems.
2. Differentiate the fundamentals of Space division switching and time division switching.
3. Design, develop and evaluate the telecom traffic to meet defined specifications and needs.
4. Identify the control of switching networks and signalling concepts.
5. Classify the engineering concepts of packet switching and routing which will help to design various switch architectures for future research work.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-056	ADVANCE SEMICONDUCTOR DEVICES	3L:0T:0P	3 Credits
----------------	--------------------------------------	-----------------	------------------

Unit	Topics	Lectures
I	Physics and Properties of Semiconductors: Introduction, Crystal Structure, Energy Bands and Energy Gap, Carrier Concentration at Thermal Equilibrium, Carrier-Transport Phenomena. Phonon, Optical, and Thermal Properties, Heterojunctions and Nanostructures, Basic Equations and Examples. <i>p-n</i> Junctions, Introduction, Depletion Region, Current-Voltage Characteristics, Junction Breakdown, Transient Behavior and Noise, Terminal Functions, Heterojunctions. Metal-Semiconductor Contacts, Metal-Insulator - Semiconductor Capacitors.	8
II	Bipolar Transistors: Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor. MOSFETs: Basic Device Characteristics, Nonuniform Doping and Buried-Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Nonvolatile Memory Devices, Single-Electron Transistor. JFETs, MESFETs, and MODFETs	8
III	Tunnel Devices: Tunnel Diode, Related Tunnel Devices, Resonant-Tunneling Diode. IMPATT Diodes: Static Characteristics, Dynamic Characteristics, Power and Efficiency, Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode.	8
IV	Transferred-Electron and Real-Space-Transfer Devices Thyristors and Power Devices Photonic Devices and Sensors: Radioactive Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers.	8
V	Photodetectors and Solar Cells: Photoconductor, Photodiodes, Avalanche Photodiode, Phototransistor, Charge-Coupled Device (CCD), Metal-semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell. Sensors: Thermal Sensors, Mechanical Sensors, Magnetic Sensors, Chemical Sensors.	8

Text Book:

1. S. M. Sze, Kwok K. NG, "Physics of Semiconductor Devices", 3rd Edition, Wiley Publication, 2015
2. Ben G. Streetman & S K Banerjee, Solid State Electronic Devices, Pearson 7th Edition, 2015
3. Jacob Millman, Christos C. Halkias, Satyabrata Jit, Electronic Devices and Circuits. Publisher: McGraw Hill, 4th Edition 2015.
4. Pierret, Robert F., Semiconductor device fundamentals. 2nd Edition, Pearson Education India, 2015.
5. Stephen A. Campbell, "Fabrication Engineering at the Micro and Nano scale", Oxford University Press, 2013
6. R. S. Muller and T. I. Kamins, Device Electronics for Integrated Circuits, 3rd Edition, Wiley, New York.

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

1. Explain the behavior of BJT and MOSFET in DC biasing and as CE amplifier circuit.
2. Describe the Tunnel diode and IMPATT diode.
3. Explain the basics of Light-Emitting Diode (LED) and evaluate the performance of Photoconductor and photodiode.
4. Distinguish the performance of Photoconductor, photodiode, Phototransistor, Charge-Coupled Device
5. Analyze the functioning of Metal-Semiconductor-Metal Photodetector.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-057	ELECTRONIC INSTRUMENTATION AND MEASUREMENTS	3L:0T:0P	3 CREDITS
----------------	--	-----------------	------------------

Unit	Topics	Lectures
I	Electrical Measurements: Measurement system, Characteristics of instruments, Methods of measurement, Errors in Measurement & Measurement standards, Measurement error combination. Review of indicating and integrating instruments: PMMC instrument, Galvanometer, DC ammeter, DC voltmeter, Series ohm meter.	8
II	Electronic Instruments: Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes. Digital voltmeter systems: Digital multimeter, digital frequency meter Instrument calibration: Comparison method, digital multimeter as standard instrument, Calibration instrument.	8
III	Measuring Methods: Voltmeter and Ammeter methods, Wheatstone bridge, Measurement of low, medium and high resistances, Insulation resistance measurement, AC bridges for measurement of inductance and capacitance.	8
IV	Electronic Measurements: Electronic instruments: Wattmeter & Energy meter. Time, Frequency and phase angle measurements using CRO; Storage oscilloscope, Spectrum & Wave analyzer, Digital counter & Frequency meter, Q meter	8
V	Instrumentation: Transducers, classification & selection of transducers, strain gauges, Thermistors, Thermocouples, LVDT, Inductive & capacitive transducers, Piezoelectric and Hall-effect transducers, Measurement of motion, force, pressure, temperature, flow and liquid level.	8

Text Book:

1. David A Bell, "Electronic Instrumentation and Measurements", Pearson Education.
2. H.S. Kalsi, "Electronic Instrumentation", 6th Edition McGraw Hill,
3. A K Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India (2015).
4. BC Nakra & K. Chaudhary, "Instrumentation, Measurement and Analysis," McGraw Hill, 2nd Edition (2009).
5. E. O. Doebelin, "Measurements systems: Applications and Design", 6th Edition, McGraw Hill 2017.
6. WD Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International (2001).
7. A. K. Ghosh, Introduction to Measurements and Instrumentation –, 2nd Edition, PHI, 2007

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

1. Classify the Instrumentation and Measurement system and various measurement errors.
2. Analyze and design voltmeter circuits, AC electronic voltmeter, digital frequency meter and current measurement with electronic instruments.
3. Evaluate various resistance and impedance measuring methods using Bridges and Q-meter.
4. Analyze fundamental operation of CRO and some special type of oscilloscopes like DSO, Sampling oscilloscope.
5. Demonstrate calibration method to calibrate various instruments and classify transducers like for force, pressure, motion, temperature measurement etc.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-058	OPTICAL COMMUNICATION	3L:0T:0P	3 Credits
----------------	------------------------------	-----------------	------------------

Unit	Topics	Lectures
I	<p>Introduction to Optical Communication: Optical Spectral Band with Operating Windows, General Communication System, Optical Communication System with its advantages.</p> <p>Optical Fiber Waveguides: Ray Theory of Transmission with TIR, Acceptance Angle, Numerical Aperture and Skew Rays, Electromagnetic Mode Theory for Optical Propagation, Modes in a Planar Guide, Phase and Group Velocity, Phase Shift with Total Internal Reflection, Evanescent Field, Goos-Haenchen Shift, Cylindrical Fiber Modes, Mode Coupling, Step Index fibers Vs Graded Index fibers, Single Mode Fibers- Cut off wavelength, MFD & Spot Size.</p>	08
II	<p>Signal Loss in Optical Fibers: Attenuation, Material Absorption Losses (Intrinsic and Extrinsic absorption), types of Linear and Non-Linear Scattering Losses, Fiber Bending Losses, Kerr Effect.</p> <p>Dispersion: Introduction with its types: Chromatic / Intramodal Dispersion (Material and Waveguide Dispersion), Intermodal dispersion (for MSI and MGI fibers), Overall (Total) Fiber Dispersion in Multimode and Single Mode Fiber, Dispersion Modified Single Mode Fibers, Polarization & Fiber Birefringence.</p>	08
III	<p>Optical Sources: LEDs-Introduction to LEDs & Materials used for fabrication, LED Power and Efficiency, LED Structures, LED Characteristics, Modulation Bandwidth.</p> <p>Laser Diodes-Introduction, Optical Feedback & Laser Oscillations, Resonant Frequencies, Laser Modes, and Threshold Condition for Laser Oscillation, Laser Diode Rate Equations, Semiconductor injection Laser- Efficiency, Laser Single Mode operation, Reliability of LED & ILD.</p>	08
IV	<p>Power Launching in Fiber: Source to Fiber Power Launching and Coupling Techniques, Power Launching Vs Wavelength, Equilibrium Numerical Aperture.</p> <p>Photo Detectors: Introduction, Physical Principles of Photodiodes: The PIN Photo Detector, Avalanche Photodiodes, Temperature Effect on Avalanche Gain, Detector Response Time, Photo Detector Noise: Noise Sources, Signal to Noise Ratio, Comparison of Photo Detectors, Fundamental Receiver Operation with Digital Signal Transmission.</p>	08
V	<p>Digital Receiver Performance: Probability of Error / BER, Receiver Sensitivity & The Quantum Limit, Error Control Techniques, Eye Diagram Pattern Features, Coherent Detection: Homodyne Detection and Heterodyne Detection, Digital links: Point to Point Links, Power Penalties, Multichannel & Multiplexing Transmission Techniques, basic concept of Free Space Optics (FSO) based Communication System.</p>	08

Text Book:

1. John M. Senior, "Optical Fiber Communications", Pearson, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", McGraw Hill, 5th Edition, 2013.
3. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
4. Joseph C. Palais, "Fiber Optic Communication", Pearson Education, 4th Edition, 2004

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

1. Define and explain the basic concepts and theory of optical communication.
2. Describe the signal losses with their computation and dispersion mechanism occurring inside the optical fiber cable.
3. Differentiate the optical sources used in optical communication with their comparative study.
4. Identify different optical components on receiver side; assemble them to solve real world problems related to optical communication systems.
5. Evaluate the performance of an optical receiver to get idea about power budget and ultimately be an engineer with adequate knowledge in optical domain.

**B.Tech 3rd Year
VI Semester
Syllabus**

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-601	DIGITAL COMMUNICATION	3L:1T:0P	4 Credits
----------------	------------------------------	-----------------	------------------

Unit	Topics	Lectures
I	Deterministic and Random Signal: Types of random variables, cumulative distribution function and probability density functions, Standard distributions: Gaussian, exponential, Rayleigh, uniform, Bernoulli, binomial, Poisson, discrete uniform and conditional distributions. Functions of one random variable: distribution, mean, variance, moments and characteristics functions.	8
II	Digital Communication & Modulation Basics: Bandpass and Lowpass signal, Introduction to Digital communication systems, PSD of Line Coding schemes, Pulse shaping, Scrambling, Eye diagram, Gram-Schmidt orthogonalization scheme. Digital Modulation: Modulation and Demodulation of Digital modulation schemes-ASK, FSK, PSK, DPSK, QPSK and Constellation diagram. Introduction to M-ary communication.	8
III	Digital Communication Through Band Limited Channels: Characteristic and signal Design of band Limited Channels. Optimum Receiver for Channel with ISI and AWGN. Linear Equalization, Decision Equalization, Adaptive Equalization. Introduction of Multichannel and Multicarrier System.	8
IV	Digital Receiver: Optimum threshold detection, Concept of Matched Filters, BER analysis of BASK, BFSK, BPSK, Spread spectrum Signal for Digital Communication: Model of Spread Spectrum Digital Communication. Direct Sequence Spread Spectrum Signal (DS-SS), Frequency Hopped Spread Spectrum Signal (FH-SS).	8
V	Information Theory: Measure of information-information, entropy, mutual information, mutual entropy, Source encoding (Shannon-Fano, Huffman), Shannon's channel capacity theorem, Introduction to error correction and detection, Linear block codes, Cyclic codes (systematic, non-systematic), BCH, Reed Solomon code. Introduction of Trellis and Graph based codes, Convolution coding and decoding.	8

Text Books:

1. John G. Proakis & Masoud Salehi, "Digital Communications", 5th Edition, McGraw Hill.
2. B.P. Lathi, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press.
3. H. Taub, D L Schilling, Gautam Saha, "Principles of Communication", 4th Edition, McGraw Hill.
4. Singh & Sapre, Analog & Digital Communication Systems, 3th Edition, McGraw Hill.
5. John G. Proakis, "Communication Systems Engineering 2nd Edition, Pearson Education, 2015

Reference Books:

1. (Schaum's Outline Series) H P HSU & D Mitra, "Analog and Digital Communications", McGraw Hill 3rd Edition.
2. Bernard Sklar, Digital Communications, Pearson Education,
3. Simon Haykin, "Communication Systems", 5th Edition, Wiley India.

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

1. To formulate basic statistics involved in communication theory.
2. To demonstrate the concepts involved in digital communication.
3. To explain the concepts of digital modulation schemes.
4. To analyze the performance of digital communication systems.
5. To apply the concept of information theory in digital systems.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-602	CONTROL SYSTEM	3L:1T:0P	4 Credits
----------------	-----------------------	-----------------	------------------

Unit	Topics	Lectures
I	Introduction to Control Systems: Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, free body diagram, analogous Systems, sensors and encoders in control systems, modeling of armature controlled and field controlled DC servomotor.	8
II	State-Variable Analysis: Introduction, vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions, Decomposition of transfer functions, Controllability and observability, Eigen Value and Eigen Vector, Diagonalization.	8
III	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, unit step response and time-domain specifications, time response of a first order system, transient response of a prototype second order system, Steady-State error, Static and dynamic error coefficients, error analysis for different types of systems.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, Routh Hurwitz criterion, Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci.	8
V	Frequency Domain Analysis: Resonant peak and Resonant frequency, Bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, polar plot, Nyquist stability criterion, stability analysis with the Bode plot, relative stability: gain margin and phase margin.	8

Text Book:

1. I. J. Nagrath & M. Gopal, "Control System Engineering", 6th Edition New Age International Publishers, 4th Edition 2018.
2. M. Gopla, "Control System Principles and Design", McGraw Hill 4th Edition
3. Ogata, "Modern Control Engineering, 5th Edition", Pearson Education, 2015
4. B.C. Kuo & Farid Golnaraghi, "Automatic Control Systems", 10th Edition, McGraw Hill
5. D. Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

Reference Books:

1. (Schaums Outlines Series) Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Control Systems", 3rd Edition, McGraw Hill, Special Indian Edition, 2010.
2. Salivahanan, "Control Systems Engineering", Pearson Education, 2015.
3. A. Anand Kumar, "Control Systems", Second Edition, PHI Learning private limited, 2014.
4. William A. Wolovich, "Automatic Control Systems", Oxford University Press, 2011.

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

1. Describe the basics of control systems along with different types of feedback and its effect. Additionally they will also be able to explain the techniques such as block diagrams reduction, signal flow graph and modelling of various physical systems along with modelling of DC servomotor.
2. Explain the concept of state variables for the representation of LTI system.
3. Interpret the time domain response analysis for various types of inputs along with the time domain specifications.
4. Distinguish the concepts of absolute and relative stability for continuous data systems along with different methods.
5. Interpret the concept of frequency domain response analysis and their specifications.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-603	ELECTROMAGNETIC FIELD THEORY AND ANTENNA	3L:1T:0P	4 Credits
----------------	---	-----------------	------------------

Unit	Topics	Lectures
I	<p>Vector Analysis: Review of vector algebra, Review of cartesian, cylindrical and spherical coordinate systems, Introduction to ∇ (operator, Use of ∇ operator as gradient, divergence, curl).</p> <p>Electrostatic fields: Introduction to coulomb's law, Gaussian law and its applications, Boundary conditions at electric interfaces, Method of images and its applications.</p> <p>Magnetostatics: Introduction to ampere's law, Ampere's law and its applications, Magnetic vector potential, Magnetic forces, Boundary conditions at magnetic interfaces.</p>	8
II	<p>Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plane waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence</p>	8
III	<p>Transmission lines: Introduction, Circuit representation of parallel plane transmission lines, Transmission lines with losses, Characteristic impedance, Propagation constant, Attenuation constant and phase constant, Reflection, Reflection coefficient, Expression for input impedance in terms of reflection coefficient, Standing wave ratio (SWR), Relation between SWR and reflection coefficient, Location of voltage maxima and minima, Impedance matching devices, Principle of impedance matching devices, Smith Chart.</p>	1
IV	<p>Antenna Introduction and Basics: Introduction, Basic antenna parameters: Reflection and Radiation Mechanism: Patterns, Beam area (or Beam solid angle) Ω_A, Radiation intensity, Beam efficiency, Directivity D and Gain G, Directivity and resolution, Antenna apertures, Effective height, The radio communication link, Fields from oscillating dipole, Single-to-noise ratio (SNR), Antenna temperature, Antenna impedance, Oscillating dipoles, Polarization.</p>	8
V	<p>Wave Propagation: Ground wave Propagation: Plane earth reflection, Space wave and surface wave, Space wave propagation: Introduction, Field strength relation, Effects of imperfect earth, Effects of curvature of earth. Sky wave propagation: Introduction structural, details of the ionosphere, Wave propagation mechanism, Refraction and reflection of sky waves by ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and skip distance, Relation between MUF and the skip distance, Multi-Hop propagation, Wave characteristics.</p>	8

Text Books:

1. MNO Sadiku, "Elements of Electromagnetic", 7th Ed, Oxford University Press, 2018.
2. WH Hayt and JA Buck, "Engineering Electromagnetic", 7th Edition McGraw Hill, 2013
3. John D Kraus, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", 5th Edition, McGraw Hill, 2017.
4. Das, Antennas and Wave Propagation, McGraw Hill.
5. K.D.Prasad, Antennas and Wave Propagation, Satya Publication
6. (Schaums Outlines Series) Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Engineering Electromagnetic", 3rd Edition, McGraw Hill, Special Indian Edition, 2010.
7. C. A. Balanis, "Antenna Theory Analysis and Design", John Wiley, 2016

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

1. Identify different coordinate systems and their applications in electromagnetic field theory to establish a relation between any two systems using the vector calculus.
2. Explain the concept of static electric field, current and properties of conductors.
3. Express the basic concepts of ground, space, sky wave propagation mechanism.
4. Demonstrate the knowledge of antenna fundamentals and radiation mechanism of the antenna.
5. Analyze and design different types of basic antennas.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-061	MICROCONTROLLER & EMBEDDED SYSTEMS	3L:0T:0P	3 Credits
----------------	---	-----------------	------------------

Unit	Topics	Lectures
I	<p>Advanced concepts in 8051 architecture: Review of 8051 architecture, concept of synchronous serial communication, SPI and I2C communication protocols, study of SPI port on 89LP 51RD2, study of SAR ADC/DAC MCP3304 / MCP 33, interfacing concepts for SPI based ADC/DAC, study of watchdog timer, study of PCA timer in different modes like capture mode, PWM generation mode, High speed output toggle mode Embedded 'C' programming for the above peripherals</p> <p>Introduction, AVR Family architecture, Register File, The ALU. Memory access and Instruction execution. I/O memory. EEPROM. I/O ports. Timers. Interrupt Structure</p>	8
II	<p>MSP430x5x Microcontroller: series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller; Sample embedded system on MSP430 microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.</p>	8
III	<p>Peripheral Devices: Watch dog timer, system clocks, Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition ADC and Comparator in MSP430, data transfer using DMA.</p>	8
IV	<p>Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.</p>	8
V	<p>Internet of Things (IoT): overview and architecture, Overview of wireless sensor networks and design examples. Various wireless connectivity: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.</p>	8

Text Books:

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and Mc Kinlay Rolin D "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication, 2006.
2. Raj Kamal, Embedded Systems, 2nd Edition McGraw Hill.
3. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication, 2008
4. Internet of Things: Principles and paradigms. R. Buyya, and A.V Dastjerdi (Elsevier), 2016.

Reference Books:

1. Raj Kamal, Microcontroller Architectures Programming Interfacing and System Design, Pearson Publication
2. Wolf, Wayne, Computers as Components – Principles of Embedded Computing System Design, Second Edition, Morgan-Kaufmann, 2008. TI MSP430x5xx and MSP430x6xx Family User's Guide, Revised 2018.

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

1. Explain the advance concept of 8051 architectures and AVR family architecture and compare them for different applications.
2. To demonstrate the basics of MSP430x5x Microcontroller
3. To execute the I/O interfacing and peripheral devices associated with Microcontroller SoC (system on chip).
4. Evaluate the data transfer information through serial & parallel ports and implement its interfacing with MSP430.
5. Demonstrate the basics of IoT, WSN and its application sectors and design IoT based projects using MSP430 microcontroller.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-062	SATELLITE COMMUNICATION	3L:0T:0P	3 Credits
---------	-------------------------	----------	-----------

Unit	Topics	Lectures
I	Introduction to Satellite Communication: History, Overview of Satellite Communication, Types of Satellite, Types of Orbit, Satellite services, Advantages & Applications of Satellite communication, Satellite Life phases, Space Debris, Introduction to Geo-synchronous and Geo-stationary satellites.	8
II	Orbital Mechanics: Orbital Mechanics, Kepler's Three laws of Planetary Motion, Developing the Equations of the orbit, Look Angle Determination, Earth Stations, Orbital Perturbations, Orbital effects in Communication system performance.	8
III	Satellite Sub-systems: Seven segments of Satellite communication, Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system. Satellite Link Design: Basic transmission theory, System noise temperature and G/T ratio, Design of down link and uplink, Design of satellite links for specified C/N.	8
IV	Introduction to Various Satellite Systems: VSAT, Direct broadcast satellite television and radio, Satellite navigation and the Global positioning systems, GPS position location principle, GPS receivers and codes, Satellite Signal Acquisition, GPS navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation.	8
V	Launchers & Advanced Technologies: Mechanism of Satellite launching, Launch Vehicles, Advanced launching tech like Space X, Intelligent Testing, Control and Decision making for Space, Inter Satellite Link. Indian Satellite Systems: History and Overview of Indian Satellite System, Achievements, GSLV, PSLV, Advanced Technology Vehicle.	8

Text Books:

1. B.Pratt, A.Bostian, "Satellite Communications", Wiley India, 2nd Edition, 2006.
2. D. Roddy, "Satellite Communications", McGraw-Hill, 4th Edition, 2001.
3. Tri T. Ha, Digital Satellite Communications, McGraw-Hill, 2nd Edition
4. D.C. Agrawal, Satellite Communication, Khanna Publishers; 7th Edition.

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

1. Define and list the benefits of satellite communication.
2. Demonstrate orbital mechanics principles of satellite communication systems and solve problems related to it.
3. Describe a satellite link and identify ways to improve the link performance.
4. Classify new technologies of satellite communication systems as per given specifications.
5. Examine advanced technologies of satellite launching and describe the Indian satellite system.

ELECTRONICS AND COMMUNICATION ENGINEERING

KEC-063	DATA COMMUNICATION NETWORKS	3L:0T:0P	3 Credits
---------	-----------------------------	----------	-----------

Unit	Topics	Lectures
I	Introduction to Networks & Data Communications: Goals and Applications of Networks ,The Internet, Protocols & Standards, Layered Tasks, OSI reference Model, TCP / IP, Addressing, Signal forms and their characteristics. Line Coding, Pulse code modulation, Delta modulation, Transmission modes. Need of multiplexing, Classification of FDM, WDM, Synchronous TDM, Statistical TDM, Spread Spectrum, Transmission media	8
II	Physical Layer: Transmission Media- Guided and unguided, Network Topology Design, Structure of Switch, Switched network classification Data Link Layer: Error detection and Correction, Framing, Flow and Error Control Protocols, Noiseless Channel and Noisy Channel Protocol, HDLC, Point-to-Point Protocol	8
III	Multiple Access: RANDOH, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization Wired LANs: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11, Bluetooth IEEE 802.16. Architecture, SONET layers, SONET frames, STS multiplexing, SONET networks, Virtual tributaries	8
IV	Network Layer: Design Issues. Routing Algorithms. Congestion control Algorithms. Internetworking –TCP/IP, IP Packet, IPv4 and IPv6 Protocols, IPV4 Addresses, Connecting Devices, Virtual LAN IPV6 Addresses. Digitization of audio and video, and their compression, Voice Over IP.	8
V	Transport Layer Protocol: Process to process delivery, UDP, TCP, ATM, Cryptography, Network Security, Session Layer-Design issues. Application Layer: Remote login, Electronic Mail and File Transfer, HTTP, WWW, SMTP, Cryptography - Basics of cryptography and its application for Message Security and User Authentication Network Security - Security in different layers of Internet. Recent advancements in networking.	8

Text Books:

1. Behrouz A. Forouzan, Introduction to Data Communications and Networking, 5th Edition, McGraw-Hill, 2017.
2. William Stallings, Data and Computer Communications, 8th Edition, Pearson Education.

Reference Books:

1. Kurose and Ross, Computer networking: A Top-Down Approach, 6th Edition, Pearson Education.
2. S. Tanenbaum, “Computer Networks”, 4th Edition, Pearson, Education 2013.

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

1. Identify the issues and challenges in the architecture of a network.
2. Analyze the services and features of various protocol layers in data layer.
3. Demonstrate the knowledge of multiple access to design a access technique for a particular application.
4. Realize protocols at different layers of a network hierarchy.
5. Recognize security issues in a network and various application of application layer.

ELECTRONICS AND COMMUNICATION ENGINEERING

EC-062	ANALOG SIGNAL PROCESSING	3L : 0T : 0P	3 Credits
--------	--------------------------	--------------	-----------

Unit	Topics	Lectures
I	Introduction to domains and the analogue/digital trade off, Introduction to current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. Second-order filter realization, filter design parameters (Q and ω_0), frequency response, Three op-amp biquad, effect of finite gain of op-amp over filters, Sallen-Key biquad.	8
II	Ideal low-pass filter, Butterworth and Chebyshev magnitude response, pole locations, low-pass filter specifications, comparison of Maximally flat and Equal ripple responses.	8
III	Delay equalization: equalization procedures, equalization with first-order and second order modules, strategies for equalization design. Definition of Bode sensitivity.	8
IV	The General Impedance Converter (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, Creating negative components.	8
V	Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, Gyrator, First and second order filters, Higher order filters	8

Text Book:

1. R. Schaumann and M.E. Valkenberg, "Design of Analog Circuits", Oxford University Press
2. J. Michael Jacob, "Applications and Design with Analog Integrated Circuits", 2nd Edition, Pearson.

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

1. Describe and apply fundamentals of signal processing in analog domain and its associated concepts like OTA and current conveyor.
2. Introduction of filter and its designing parameters
3. Solve problems and design higher order filters like Butterworth and Chebyshev.
4. Understand and explain the reasons for delay in filter designing and its procedure to equalize.
5. Understand the principles of the inductor simulation like general impedance convertor (GIC), optimal design of the GIC, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique which are used for placing equivalent inductor on integrated circuits.

KEC-651	DIGITAL COMMUNICATION LAB	0L:0T:2P	1 Credit
---------	---------------------------	----------	----------

SUGGESTIVE LIST OF EXPERIMENTS:

Part A

1. To study Eye diagram patterns of various digital pulses.
2. To study the inter symbol interference.
3. To study generation of Unipolar RZ & NRZ Line Coding.
4. To study generation of Polar RZ & NRZ Line Coding.
5. To study generation of Bipolar RZ & NRZ Line Coding.
6. Implementation and analysis of BASK modulation and demodulation
7. Implementation and analysis of BFSK modulation and demodulation
8. Implementation and analysis of BPSK modulation and demodulation. (*Through Virtual Lab*)
9. Implementation and analysis of QPSK modulation and demodulation. (*Through Virtual Lab*)
10. To simulate M-ary Phase shift keying technique using MATLAB.
11. To study generation and detection of DPSK using MATLAB.
12. Implementation and analysis of Delta modulation and demodulation.
13. Implementation and analysis of DSSS Modulation, Demodulation & BER measurement.
14. Implementation and analysis of FHSS Modulation, Demodulation & BER measurement.
15. To study encoding and decoding of Linear Block Codes
16. To study the working of Convolution encoder.

Part B

1. To study simple dipole antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
2. To study folded dipole antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
3. To study phase array end-fire antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
4. To study broadside array antenna and to calculate beam-width, front / back ratio, and gain of the antenna.

Virtual Lab Link: <https://vlab.amrita.edu/?sub=1&brch=201>

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

1. To formulate basic concepts of pulse shaping in digital communication.
2. To identify different line coding techniques and demonstrate the concepts.
3. To design equipments related to digital modulation and demodulation schemes.
4. To analyze the performance of various digital communication systems and evaluate the key parameters.
5. To conceptualize error detection & correction using different coding schemes in digital communication.

SUGGESTIVE LIST OF EXPERIMENTS:

1. Introduction to MATLAB Control System Toolbox.
2. Determine transpose, inverse values of given matrix.
3. Plot the pole-zero configuration in s-plane for the given transfer function.
4. Determine the transfer function for given closed loop system in block diagram representation.
5. Create the state space model of a linear continuous system.
6. Determine the State Space representations of the given transfer function.
7. Determine the time response of the given system subjected to any arbitrary input.
8. Plot unit step response of given transfer function and find delay time, rise time, peak time, peak overshoot and settling time.
9. Determine the steady state errors of a given transfer function.
10. Plot root locus of given transfer function, locate closed loop poles for different values of k .
11. Plot bode plot of given transfer function. Also determine gain and phase margins.
12. Plot Nyquist plot for given transfer function. Also determine the relative stability by measuring gain and phase margin.

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

1. Classify different tools in MATLAB along with the basic matrix operations used in MATLAB.
2. Evaluate the poles and zeros on s-plane along with transfer function of a given system.
3. Construct state space model of a linear continuous system.
4. Evaluate the various specifications of time domain response of a given system.
5. Appraise the steady state error of a given transfer function.
6. Examine the relative stability of a given transfer function using various methods such as root locus, Bode plot and Nyquist plot.

KEC-653	CAD FOR ELECTRONICS LAB	0L:0T:2P	1 Credit
---------	-------------------------	----------	----------

SUGGESTIVE LIST OF EXPERIMENTS:

Part A

PSPICE Experiments:

- (a) Transient Analysis of BJT inverter using step input.
(b) DC Analysis (VTC) of BJT inverter
- (a) Transient Analysis of NMOS inverter using step input.
(b) Transient Analysis of NMOS inverter using pulse input.
(c) DC Analysis (VTC) of NMOS inverter.
- (a) Analysis of CMOS inverter using step input.
(b) Transient Analysis of CMOS inverter using step input with parameters.
(c) Transient Analysis of CMOS inverter using pulse input.
(d) Transient Analysis of CMOS inverter using pulse input with parameters.
(e) DC Analysis (VTC) of CMOS inverter with and without parameters.
- Transient & DC Analysis of NAND Gate using CMOS inverter.
- Transient Analysis of NOR Gate inverter and implementation of XOR gate using NOR gate
- To design and perform transient analysis of D latch using CMOS inverter.
- To design and perform the transient analysis of SR latch circuit using CMOS inverter.
- To design and perform the transient analysis of CMOS transmission gate.
- Analysis of frequency response of Common Source amplifiers.
- Analysis of frequency response of Source Follower amplifiers

Part B :

HDL (using VHDL program module & verilog Module)

VHDL PROGRAMS

- Design and Simulation of Full Adder using VHDL program module
- Design and Simulation of 4x1 MUX using VHDL **program module**
- Design and Simulation of BCD to Excess-3 code using VHDL **program module**
- Design and Simulation of 3 to 8 decoder using VHDL **program module**
- Design and Simulation of JK Flip-flop using VHDL **program module**
- Design and Simulation of CMOS Inverter using **verilog Module**

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

- Design and analyze the performance of different type of inverters.
- Design and analyze the performance of the basic logic gates using CMOS inverter circuit.
- Design and analyze the performance of the memory based digital circuits using CMOS inverter circuit.
- Analyze the performance of the different configuration of MOS amplifier circuits.

SUGGESTIVE LIST OF EXPERIMENTS:

1. Measurement of phase difference and frequency using CRO (Lissajous Figure)
2. Study of L.C.R. Bridge and determination of the value of the given components.
3. Characteristics of Thermocouples and RTD.
4. Study of the following transducer (i) PT-100 Transducer (ii) J-Type Transducer (iii) K-Type Transducer (iv) Pressure Transducer
5. Characteristics of LDR, Photo Diode, and Phototransistor:
 - (i) Variable Illumination.
 - (ii) Linear Displacement
6. Characteristics of LVDT.
7. Study of the transistor tester and determination of the parameters of the given transistors
8. Experiment using PLC Trainer Kits

Through Virtual Lab:

9. Measurement of low resistance Kelvin's double bridge.
10. To measure unknown capacitance of small capacitors by using Schering's bridge.
11. To measure unknown Inductance using Hay's bridge.
12. Measurement of capacitance by De Sauty Bridge.

Virtual Lab Link: <http://vlabs.iitkgp.ernet.in/asnm/#>

Available on: <http://www.vlab.co.in/broad-area-electronics-and-communications>

Course Outcomes:

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

1. Measure the unknown resistance, capacitance and inductance using LCR Bridge, Kelvin double bridge, Schering bridge, Hay's bridge, De sauty bridge.
2. Practically demonstrate the different types of transducers like J-type, K-type, PT-100 and RTD.
3. Interpret frequency and phase difference from Lissajous figure.
4. Interpret hybrid parameters of transistor and demonstrate different transducer like LDR and LVDT.
5. Demonstrate Experiment using PLC Trainer Kits

Bundelkhand Institute of Engineering and Technology

(BIET) Jhansi, UP



Syllabus

4th Year

B.Tech. Electronics & Communication Engineering

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics &
Communication Engineering

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			Es E		
			L	T	P	CT	TA	Total 1			
THEORY SUBJECTS											
1.	EOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	EOE 02*	Departmental Elective-II	3	1	0	30	20	50	100	150	4
3.	EEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	EEC 702	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	EEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	EEC 751	Microwave & Fiber Optic Lab	0	0	2	-	20	20	30	50	1
8.	EEC 752	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	1
9.	EEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	0	50	1
10.	EEC 754	Project	0	0	2	-	50	50	-	50	1
11.	GP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	15	5	9	150	210	410	590	1000	26

**** Open Electives-I**

EOE07 1	Entrepreneurship Development
EOE-072	Quality Management
EOE-073	Operation Research
EOE-074	introduction to Biotechnology
EOE-075/EIC-034	Micro and smart systems

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics &
Communication Engineering

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			Es		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	EEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	EEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	EEC 802	Electronics Switching	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	EEC 851	Project	0	0	12	-	100	100	250	350	8
7..	GP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	12	4	12	120	180	350	650	1000	24

**** Open Electives-II**

EOE-081 Non-Conventional Energy Resources
EOE-082 Nonlinear Dynamic System
EOE-083 Product Development
EOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – I

1. EEC 011 Analog Signal Processing
2. EEC 012 Data Structure
3. EEC 013 Advance Semiconductor Devices
4. EEC 014 Microcontroller

Elective – II

1. EEC 021 Satellite Communication
2. EEC 022 Digital Image Processing
3. EEC 023 ANN
4. EEC 024 Filter Design

Elective – III

1. EEC 031 Optical Networks
2. EEC 032 Digital System Design using VHDL
3. EEC 033 Speech Processing
4. EEC 034 Integrated Circuit Technology
5. EEC 035 Introduction to RADAR systems

SYLLABUS
EEC 701 OPTICAL COMMUNICATION

Course outcome (CO)	Statements
EEC701-1	Identify and characterize different components of an Optical Fiber Communication link.
EEC701-2	Understand and Analyze optical source, Fiber and Detector operational parameters
EEC701-3	Compute optical fiber link design parameters
EEC701-4	Understand WDM, Optical Amplifiers, Optical Switching and networking technology concepts.

EEC 701 OPTICAL COMMUNICATION		3 1 0
UNIT	TOPICS	LECTURES
I	Overview of optical fiber communication- The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Optical fiber Modes and configuration, Mode theory for circular Waveguides, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index. Fiber Material and its Fabrication Techniques	8
II	Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Attenuation Measurements Techniques, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening. Overall fiber dispersion in Multi mode and Single mode fibers, Fiber dispersion measurement techniques, Non linear effects. Optical fiber Connectors: Joints, Couplers and Isolators.	8
III	Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Laser Diodes- Basic concepts, Classifications, Semiconductor injection Laser: Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, resonant frequencies, reliability of LED & ILD	8
IV	Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling. Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors. Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers	8
V	Link Design: Point to Point Links, Power Penalties, Error control, Multichannel Transmission Techniques, WDM concepts and component overview, OTDR and optical Power meter	8

TEXT BOOKS:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

REFERENCE BOOKS

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

EEC 702 DATA COMMUNICATION NETWORKS

Course outcome (CO)	Statements
EEC702-1	Students will be able to analyse the different types of network topologies and to enumerate the layers of OSI model and TCP/IP model.
EEC702-2	Students will be able to design a system for utilizing the bandwidth in efficient way.
EEC702-3	Students will be able to apply the basics of circuit switching and the multi-stage switching technologies and apply the same for the analysis and design of optimized switching network.
EEC702-4	Students will be able to analyse the different protocols working at various layers of TCP/IP model and apply the knowledge of same to design a given network.
EEC702-5	Students will have basic comprehensive knowledge of various routing algorithms and apply this knowledge to design a network based on a given constraints.

EEC 702 DATA COMMUNICATION NETWORKS		3 1 0
Unit	Topic	Lectures
I	Introduction to Networks & Data Communications The Internet, Protocols & Standards, Layered Tasks, OSI Model, TCP / IP, Addressing, Line Coding Review, Transmission Media: Guided and unguided Media Review.	8
II	Switching: Datagram Networks, Virtual Circuit Networks, Structure of a switch ,Ethernet Physical Layer, Data Link Layer: Error detection and Correction Data Link Control: Framing, Flow and Error Control Protocols, Noiseless Channel and Noisy Channel Protocol, HDLC, Point-to-Point Protocol	8
III	Multiple Access : RANDOH, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization Wired LANs: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11, Bluetooth IEEE 802.16	8
IV	Network Layer : Design Issues. Routing Algorithms. Congestion control Algorithms.IPV4 Addresses, Connecting Devices, Virtual LAN IPV6 Addresses, Internet Protocol, Hardware Addressing versus IP Addressing, IP Data Gram	8
V	Transport Layer Protocol : UDP and TCP, ATM ATM, Cryptography, Network Security	8

Text Books:

1. B. A. Forouzan, "Data Communications and Networking", MGH, 4th ed. 2007

Reference Books:

1. A. S. Tanenbaum, "Computer Networks", PHI.
2. W. Stallings, "Data and Computer Communication", PHI.

EEC 703 VLSI DESIGN

Course outcome (CO)	Statements
EEC703-1	Students will be able to fabricate the different layers involved in semiconductor devices. Further, students will be able to analyze the effects of scaling of MOSFET.
EEC703-2	Students will be able to synthesize different MOS inverters for the given power and delay.
EEC703-3	Students will be able to design the combinational and sequential basic logic circuits by using MOS inverters, especially CMOS inverter.
EEC703-4	Students will be able to analyse the dynamic logic circuits and designing of semiconductor memories such as DRAM, SRAM, ROM, and flash memory.
EEC703-5	Students will have basic comprehensive knowledge of power budgeting and switching speed of low power CMOS logic circuits. Further, Students will be able to design the techniques for testing the MOS logic circuits.

EEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design. MOS Transistor : MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances	8
II	MOS Inverters: Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.	8
III	Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates) Sequential MOS Logic Circuits: Introduction, behaviour bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Sung-Mo Kang & Yosuf Leblebici, “CMOS Digital Integrated Circuits: Analysis & Design”, TMH, 3rd Edition.

Reference Books:

2. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
3. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES II

EEC 021 SATELLITE COMMUNICATIONS		3 1 0
Unit	Topic	Lectures
I	Elements of Satellite Communication. Orbital mechanics, look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.	8
II	Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna Satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.	8
III	Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc. Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary,	8
IV	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, Timing accuracy, GPS Receiver Operation	8
V	Global Mobile Satellite Systems, Antenna System for mobile satellite applications, Evolution, Antenna Requirement and Technical Characteristics, Classification of Mobile Satellite Antenna(MSA), Low gain omni directional Antenna, Medium gain Directional Antenna, High gain Directional Aperture Antenna, Wire Quadrifilar Helix Antenna(WQHA) for Hand held Terminals, Antenna Systems for Mobile Satellite Broadcasting.	8

Text/ Reference Books:

1. B. Pratt, A. Bostian, "Satellite Communications", Wiley India.
2. D. Roddy, "Satellite Communications", TMH, 4th Ed.
3. S. D. Ilcev, "Global Mobile Satellite Communication", Springer
4. R. Pandya, "Mobile and Personal Communication Systems and Services ", PHI.

EEC 022 DIGITAL IMAGE PROCESSING		3 1 0
Unit	Topic	Lectures
I & II	Introduction: Fundamental steps in DIP, elements of DIP, Simple image model, sampling & quantization, basic relationships between pixels, colour image model. Image Transforms: One-dimensional & two-dimensional DFT, cosine, sine, Hadamard, Haar, and Slant & KL transforms. Image Enhancement: Introduction, point operations, histogram modelling, spatial operations, Transform operations.	8
III	Image Restoration: Introduction, image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain.	8
IV	Image Compression: Introduction, Pixel coding, Predictive coding, Transform coding, Inter-frame coding	8
V	Image Segmentation: Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.	8

Text Books:

1. Rafael C. Gonzalez Richard E Woods, "Digital Image Processing", Pearson, 3rd Ed. 2009.
2. Anil K Jain, "Fundamentals of Digital Image Processing", PHI.

EEC-023 Artificial Neural Network		3 1 0
Unit	Topic	Lectures
I	Introduction: Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks.	4
	Learning Process : Supervised Learning, Unsupervised Learning, Reinforcement Learning, Competitive Learning	3
II	Artificial neurons, Neural networks and architectures	2
	Introduction, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture.	1
	Geometry of Binary threshold neurons and their networks, Complex Neuron Model	3
	Learning Rules : Hebbian Learning rule, Perceptron Learning rule, Winner Take all Algorithm, Delta Learning rule	2
III	Stochastic Machines	3
	Statistical mechanics, simulated annealing, Boltzmann machine.	2
IV	Perceptrons and LMS	4
	Learning objective of TLN, pattern space & weight space, TDNN, Multilayered architecture, back propagation learning algorithm, applications of feed forward neural networks, RBF Networks	3
V	Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptrons.	7
	Adaptive Resonance Theory Building blocks of adaptive resonance, Adaptive Resonance Theory 1. Self Organizing Feature MAP, K means Algorithm	5
	Introduction, Maximal eigenvector filtering, principal component analysis, Fuzzy Logic : Introduction, Membership Functions, Fuzzy Rules, Fuzzy System, Hybrid Neuro Fuzzy System, Applications	

Text Books:

1. Kumar Satish, "Neural Networks", TMH
2. Simon Haykin, "Neural Networks", PHI
3. J. M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishers, 3rd Ed.

Course Outcomes: - B.Tech. (ECE) 7th Sem., EEC-024, Filter Design

Sr. No.	Outcomes
CO1	Implement and demonstrate various analog electronic circuits : LPF,HPF,BPF,BSF
CO2	Apply appropriate filters design to meet specifications like Butterworth approximation, Chebyshev approximation, Inverse Chebyshev approximation to solve real world problems efficiently.
CO3	Analyze the various parameters, characteristics and specifications of devices, amplifier, data converters and timers
CO4	Illustrate and compare various techniques for Elementary transconductor building blocks
CO5	Illustrate various Switched capacitor filters

B.Tech. (ECE) 7 th Sem., EEC-024, Filter Design								
Periods		Sessional Exam			ESE	Subject Total		Credit
L	T	P	CT	TA	Total			
3	1	0	30	20	50	100	150	4
Unit	Topic						CO	Lectures
I	Review of op-amps circuits, Categorization of filters-Low-pass filter, High-pass filter, band-pass filter, band-reject filter, Gain equalizers, and Delay equalizers						CO1	8
II	Approximation Theory: Butterworth approximation, Chebyshev approximation, Inverse Chebyshev approximation, Basic of sensitivity, Frequency Transformations.						CO2	8
III	Three amplifier Biquad: Basic low pass and band pass circuit, realization of the general Biquadratic Functions, summing of four Amplifier biquad, feed forward three amplifier biquad, Passive Ladder structures, Inductor Substitution using Gyrator, Transformation of elements using the FDNR. Active ladder filters. Active R filters.						CO3	10
IV	Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, gyrator, First and second order filters, higher order filters						CO4	8
V	Switched capacitor filters: The MOS switch, The switched capacitor, first order building blocks, second order sections, sampled data operation, Switched capacitor first and second order filters, Bilinear transformation based SC filter design.						CO5	8
								40
Text Books	1	Gobind Daryanani, "Principles of active network synthesis and design", John Wiley & Sons						
Ref. Books	2	R. Schaumann, M. E. Van Valkenburg, "Design of analog filters", Oxford University Press						

EEC 751 Microwave and Optical Communication Lab

Course outcome (CO)	Statements
EEC751-1	Students will be able to measure the guided wavelength and impedance of unknown load.
EEC751-2	Students will be able to measure the S-parameter of various microwave components.
EEC751-3	Students will be able to the coupling coefficient, insertion loss, directivity, and isolation coefficient of multihole directional coupler
EEC751-4	Students will be able to measure the radiation pattern and beam width of waveguide horn
EEC751-5	Students will be able to measuring different kinds of losses in the fiber setting up analog fiber link
EEC751-6	Students will be able to measure the numerical aperture of the fiber
EEC751-7	Students will be able to perform the digital time division multiplexing

Minimum Ten Experiments to be conducted:

Part – A (Any 6 Experiments):

1. Study of Reflex Klystron Characteristics.
2. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench
4. Determine the S-parameter of any Three port Tee.
5. Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator .
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of any Multi-Hole directional coupler.
9. To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED's and photo detector.

EEC 752 Electronic Circuit Design

1. Course Outcomes:

Course outcomes (COs)	Statements
EEC 752-1	Students will be able to realize the universal op-amp based biquad and universal OTA biquad.
EEC 752-2	Students will be able to design amplitude control or stabilization applied to any sinusoidal oscillators and op-amp/ OTA based function generator.
EEC 752-3	Students will be able to design the any application of log/antilog circuits and any applications of analog multiplier/ divider.
EEC 752-4	Students will be able to analyze any digital system design and its hardware implementation using TTL/ CMOS ICs
EEC 752-5	Students will be able to any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

EEC 752 Electronic Circuit Design

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make a hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.
5. A report is to be made for evaluation.

EEC 801 Mobile and Wireless Communication

Course outcome (CO)	Statements
EEC801-1	Students will be able to analyze the fundamentals of evolution of mobile radio communication. They will also be able to analyse the large scale path loss, propagation models, reflection, diffraction, scattering, practical link budget design using path loss model, small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels, small scale multipath measurements, parameters of mobile multipath channels types of small scale fading.
EEC801-2	Students will be able to analyze the fundamentals of equalisation, equalisers in communication receiver, survey of equalisation techniques, linear equaliser, algorithms for adaptive equalization, diversity techniques, RAKE receiver. characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, multiple access techniques for wireless communications.
EEC801-3	Students will be able to analyze cellular concepts, frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems..
EEC801-4	Students will be able to analyze GSM system for mobile services and features, system architecture, radio sub system channel types, frame structure. CDMA digital cellular standard (IS 95), frequency and channel specifications, forward CDMA channel and reverse CDMA channel.
EEC801-5	Students will be able to analyze the introduction to mobile adhoc networks, mobile data networks, wireless standards IMT2000, Introduction to 4G and concept of NGN.

EEC 801 Mobile and Wireless Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels. Small scale Multipath Measurements, Parameters of Mobile Multipath Channels types of small scale fading.	8
II	Fundamentals of equalisation, Equalisers in communication receiver, Survey of equalisation techniques, linear equaliser, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver. Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, Multiple Access techniques for Wireless Communications.	8
III	Cellular concepts, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.	8
IV	GSM system for mobile: Services and features, System Architecture, Radio Sub system Channel types, Frame Structure. CDMA Digital Cellular Standard (IS 95): Frequency and Channel specifications, Forward CDMA channel and reverse CDMA channel	8
V	Introduction to Mobile Adhoc Networks, Mobile data networks, wireless standards IMT2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson, Second Edition.
2. T L Singal, "Wireless Communications ", McGraw Hill Publications.
3. R. Pandya, " Mobile and personal communication system", PHI.

Reference Books:

1. Andrea Goldsmith, "Wireless Communications", Cambridge University press.
2. Andreas F. Molisch, "Wireless Communications", Wiley Student Edition.
3. S. Haykin & M. Moher, "Modern wireless communication", Pearson, 2005.

EEC 802 ELECTRONIC SWITCHING			
Unit	Topic	Text Book/ Chapter	Lectures
I	Evolution of Switching systems: Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.	2/3	8
II	Digital switching: Switching functions, space division switching, Time division switching, two dimensional switching, Digital cross connect systems, digital switching in analog environment.	3/5	8
III	Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modelling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, Delay systems.	1/8	8
IV	Control of Switching Systems: Introduction, Call processing functions; common control, Reliability availability and security; Stored program control. Signalling: Introduction, Customer line signalling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signalling, Common channel signalling principles, CCITT signalling system No. 6 and 7, Digital customer line signalling.	2/7 2/8	8
V	Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching, ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch.	3/10	8

Text Books:

1. Thiagarajan Viswanathan, "Telecommunication switching System and networks", PHI.
2. J.E. Flood, "Telecommunication switching, Traffic and Networks", Pearson education.
3. J.C. Bellamy, "Digital Telephony", John Wiley, 3rd Ed.

ELECTIVE III

EEC 031 OPTICAL NETWORKS		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Networks- Principles and Challenges and its Generation, Characteristics of Optical Fiber in non linear region ,Optical Packet Switching, Transmission Basics, Multiplexers & Filters,	8
II	Optical Amplifiers ,Tunable Lasers, Switches, Wavelength Converters. Sub-Carrier Modulation and Multiplexing,Spectral efficiency,Crosstalk,Introduction of Soliton systems.	8
III	SONET/SDH: Multiplexing, SONET/ SDH Layers, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure, Ethernet. Optical Transport Network, Generic framing Procedure, IP routing and forwarding and QOS. WDM Network Elements Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching OTDM, Synchronization, Header Processing, Buffering, Burst Switching. Deployment Considerations- SONET/SDH core Network	

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

Subject: Digital System Design using VHDL

Subject Code: EEC 032

Course outcomes:		Bloom's Knowledge Level (KL)
Upon completion of the course, the students will be able to:		
CO1	Understand and apply basic knowledge of VHDL structure and important keywords	KL2 & KL3

CO2	Analyse digital system design using automation, RTL design using VHDL, constructs for structures	KL4
CO3	To understand concurrent constructs for resister transfer level descriptions	KL2
CO4	Evaluate VHDL signal models	KL5
CO5	Analyse hardware cores and models	KL6

KL: Bloom's knowledge level, KL1: remember, KL2: Understand, KL3: Apply, KL4: Analyse, KL5: Evaluate, KL6: Create

I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

TEXT BOOKS:

1. Z. Navabi, “VHDL-Modular Design and Synthesis of cores and Systems”, TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, “Introduction to VHDL” Spriger Publication, 2010.

REFERENCE BOOKS:

3. C. H. Roth, “Digital System Design using VHDL”, PWS Publishing
4. Douglas Perry, “VHDL- Programming by examples”, MGH

EEC 033 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	10
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech & silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	10
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for autocorrelation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, "Digital Processing of speech signals", Pearson Education.
2. B. Gold and Nelson Morgan, "Speech and audio signal processing", Wiley India Edition, 2006.

EEC 034 INTEGRATED CIRCUIT TECHNOLOGY		3 1 0
Unit	Topic	Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon , Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources , Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.	8
IV	Metallization: :Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Book:

1. S. M. Sze, “VLSI Technology”, 2nd Edition, McGraw –Hill Publication.

Reference Books:

1. S.K. Ghandhi, “VLSI Fabrication Principles”, 2nd Edition,. Willy-India Pvt. Ltd.
2. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, practice and modelling”, Pearson Education.
3. Stephen A. Campbell, “Fabrication Engineering at the micro and nano scale”, Oxford Univ Press.

EEC 035 INTRODUCTION TO RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to Radar: Basic Radar, The Simply Form of the Radar Equations, Radar Block Diagram, Radar Frequencies, Applications of Radar. The Radar Equation: Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probabilities of Detection and False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets, Radar Cross-Section of Targets, Radar Cross-Section Fluctuations, Transmitter Power, Pulse Repetition Frequency, Antenna Parameters, System Losses, Problems	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay-Line Cancelers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: Tracking with Radar, Mono pulse Tracking, Conical Scan and Sequential Lobing, Limitations to tracking Accuracy, Low-Angle Tracking, Tracking in Range, Other Tracking Radar Topics, Comparison of Trackers, Automatic Tracking with Surveillance Radars(ADT)	8
IV	Detection of Signals in Noise: Introduction, Detection Criteria, Detectors, Automatic Detection, Integrators, Constant-False-Alarm Rate Receivers.	8
V	Information from Radar Signals: Basic Radar Measurements, Theoretical Accuracy of Radar Measurements, Ambiguity Diagram, Pulse Compression, Target Recognition, Land Clutter, Sea Clutter, Weather Clutter	8

Text/ Reference Books:

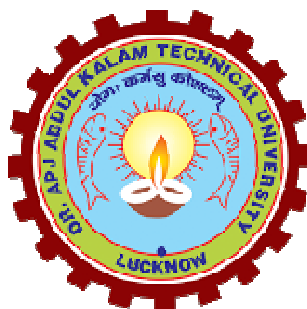
1. Merrill I. Skolnik " Introduction to Radar Systems" Third Edition.
2. J.C. Toomay , Paul J. Hannen " Principles of Radar" Third Edition.

EIC-034/EOE-075 MICRO AND SMART SYSTEMS		3 1 0
UNIT	TOPICS	LECTURES
I	Introduction, Why miniaturization?, Microsystems versus MEMS, Why micro fabrication?, smart materials, structures and systems, integrated Microsystems, applications of smart materials and Microsystems,.	5
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.	8
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.	8
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 electro-mechanics.	8
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 book:

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

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

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

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, 4C/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++, Pointers 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 Complete 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

K₁ – Remember, K₂ – Understand, K₃ – Apply, K₄ – Analyze, K₅ – Evaluate, K₆ – 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. K₂
CO 2	Construct an ER Model for a given problem and transform it into a relation database schema. K₅, K₆
CO 3	Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus. K₅, K₆
CO 4	Explain the need of normalization and normalize a given relation to the desired normal form. K₂, K₃
CO 5	Explain different approaches of transaction processing and concurrency control. K₂

DETAILED SYLLABUS		3-0-0
Unit		Lecture
I	<p>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.</p> <p>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.</p>	08
II	<p>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.</p> <p>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</p>	08
III	<p>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.</p> <p>PL/SQL: Introduction, features, syntax and constructs, SQL within PL/SL, DML in PL/SQL Cursors, stored procedures, stored function, database triggers, indices</p>	08
IV	<p>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.</p> <p>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.</p>	08

V	<p>Database Security – Types of security, system failure, backup & recovery techniques, authorization & authentication, system policies, levels of security – physical, OS, network & DBMS, privileges – grant & revoke.</p> <p>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</p>	08
---	--	----

Text books:

1. Elmasri, Navathe, “Fundamentals of Database System”, Addison 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”, Addison 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. Gopaldaswamy 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