SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Outcome based Curriculum for

Undergraduate Degree Courses in Engineering & Technology

Department of Electronics and Instrumentation Engineering

ELECTRONICS AND INSTRUMENTATION ENGINEERING DEPARTMENT

1) **Vision** :"To be an acknowledged leader in providing quality education, training and research in the area of **Electronics and Instrumentation Engineering** to meet the industrial and societal needs"

2) **Mission:**

1. To impart technical knowledge, leadership and managerial skills to meet the current industrial and societal needs

2. To maintain active linkages with industries and research institutions

3. To create passion for learning and foster innovation by nurturing talents towards serving the society with high moral, ethical and professional standards

4. To prepare and build the ability for independent and lifelong learning in the context of technological changes

5. To enrich the knowledge and skills of student and faculty through continuous learning and active research

(3)Program Educational Preambles (PEO's)

PEO-1.The graduates will have core competency in mathematical, science and engineering fundamentals required for employment and higher studies.

PEO-2.The graduates will be able to analyze, design, control and provide solutions to various process industries.

PEO-3.The graduates will exhibit professional knowledge and ethical attitude, along with skills like team work, leadership, effective communication, multi-disciplinary approach.

(4)Program Outcomes (PO's)

PO-1.Knowledge of Basic Sciences and Basic Engineering:

The students shall be able to apply the principles of Basic Sciences and Mathematical skills in learning in Basic Engineering subjects from allied branches like Electrical engineering, Electronics etc. The knowledge gained thus enables the students to apply them in learning the core branch viz. The Instrumentation Engineering.

PO-2. Computational Skills:

The students shall acquire Analytical Thinking; Problem solving abilities, get exposure to the modern computational procedures and apply them in the core Instrumentation Engineering.

PO-3. Design and Development of Solutions:

The background knowledge gained, the Analytical and computational skills acquired by the students shall enable the students to apply them in the core Instrumentation Engineering to design Electronic circuits, highly sensitive sensors networks for monitoring and control of various physical, chemical, pharmaceutical and Industrial parameters and processes.

PO-4. Conduct of Investigations into Complex Problems:

The students shall be able to apply the knowledge and adopt research methodologies for the modernization of existing designs of Instruments, design sophisticated instrumentation systems interfaced to dedicated embedded controllers or High-end computers. They shall be able to Acquire, Analyze, Interpret and Control any complex processes or problems in Industry and R&D.

PO-5. Usage of Modern Tools:

The students gain expertise in the utilization of modern software tools like C, JAVA, Multisim,Signal and Image processing tools for applications in communications, Biomedical (ECG, EEG,MRI) etc; Hardware gadgets like the Digital Storage Oscilloscopes, Function Generators, Spectrum Analyzers; and ultra-sensitive instruments like the UV-VIS and Infra-Red Spectrophotometers, Chromatographs, Process control stations etc. for applications in Industry and R&D.

PO-6. Engineers and Society:

The students of engineering should be motivated to utilize their Scientific, Technological, Computational and Instrumentation skills for the better addressing the societal needs. Design

new sophisticated instruments for the high-end Research and Process Industries, Pharmaceutical, Bio-medical fields. They should utilize their expertise to develop indigenous technologies, instruments, gadgets, affordable by common people. Design inexpensive healthcare systems and extend the same to the remote areas through tele-medical network system making use of INSAT facility.

PO-7. Environment and Sustainability:

Instrumentation Engineering is a multi-disciplinary branch. The students shall be motivated to utilize their knowledge for design of highly sensitive and low energy consumption, low radiation emitting, lower environment polluting instruments, operating on renewable energy sources and implement all such measures to sustain the quality of the environment.

PO-8.Ethics:

The students are motivated to follow a code of ethics and moral perspectives at the individual level as well as at the professional level to protect the interests of all the stakeholders, with a concern for societal responsibilities.

PO-9.Individual and Team work:

Communication skills, Aptitude development programs, Team activities like POGIL, Seminar Presentations etc contribute greatly for the development of individual talents/skills. Involvement in Professional, Cultural, Sports activities provided in the institute shall also develop capabilities of a student to mould oneself as an Individual member, Team leader or an Organizer.

PO-10.Communication Skills:

The intensity of inputs (Listening, Speaking, Reading and Writing Skills) inputs and trainings imparted through all these activities, the students shall acquire excellent communication skills both orally as well as writing. They shall be able to transform their innovative ideas into excellent technical reports for presentation/publication in seminars/journals.

PO-11. Project Management and Finance:

The students shall be able to conceptualize ideas, formulate projects, visualize their execution and realized final product. The students shall demonstrate the skills required for drafting of proposals for projects with thorough understanding of the procurement plans (materials, software, hardware), project management and financial allocations and management during the execution of the project.

PO-12. Life-Long learning:

The students shall be motivated to keep themselves in-tune with the contemporary changes in technological processes through life-long learning and also contribute their expertise for the benefit of the current stake holders and the society.

(5)Program specific outcomes (PSOs)

PSO-1. Ability to establish talents in designing, implementing, evaluating, measurement and control of systems in process industries.

PSO-2 . Ability to design analog and digital systems for various projects and applications.

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Outcome based Curriculum for

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Department of Electronics and Instrumentation Engineering

(06) Programme PO's and PSO's Mapping

			PO 1	PO 2	PO3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	PO10	PO11	PO 12		
S. No	**Program**	**Courses Category**	Engineering Knowledge	Problem Analysis	Design/ Development of Solution	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management	Life-Long Learning	**PSO 1**	**PSO 2**
1	BE (EI)	Humanities and Social Sciences including Management courses	*	*			*	*		*		*		*		
2		Basic Science courses	*	*	*	*	*		*							
3		Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	*	*	*		*							*		
4		Professional core courses	*	*	*	*										
5		Professional Elective courses	*	*	*	*	*	*		*	*					

		relevant to chosen specialization/branch													
6		Open subjects – Electives from other technical and /or emerging *subjects	*	*	*	*	*	*	*	*	*			*	*	*
7		Project work, seminar and internship in industry or elsewhere		*	*	*		*	*	*	*	*	*	*		*
8		Specific core subject		*	*	*										
9		Mandatory Course (Non credit)						*	*	*	*	*		*		

(07) Semester wise PO's and SPO's Mapping

s.no	Semester	Name of the Courses/POs(Basic, Core Electives, Projects, Internships etc.)	PO 1 Engineering Knowledge	PO 2 Problem Analysis	PO3 Design/Development of Solution	PO 4 Investigation	PO 5 Modern Tool Usage	PO 6 The Engineer and Society	PO 7 Environment and Sustainability	PO 8 Ethics	PO 9 Individual and Team Work	PO 10 Communication	PO 11 Project Management	PO 12 Life-Long Learning	PSO 1	PSO 2
1	Semester-Ist	Mathematics-I	*	*	*	*								*		
		Engineering Physics	*	*		*								*		
		Basic Computer Engineering	*	*	*	*	*			*		*		*		
		Basic Mechanical Engineering	*	*	*	*	*									
		Basic Civil Engineering & Mechanics	*	*	*				*						*	
		Language Lab					*			*	*	*		*		
		Self Study / GD Seminar	*	*	*	*	*			*	*		*	*		
2	Semester-IInd	Mathematics-II	*	*	*	*								*		
		Engineering Chemistry	*	*	*	*										
		English for Communication	*									*			*	
		Basic Electrical & Electronics Engineering	*	*	*	*										
		Engineering Graphics	*	*	*	*										*
		Manufacturing Practices					*			*	*	*	*	*		
		Industrial Training			*	*		*	*	*	*		*	*	*	
3	Semester-	Mathematics -III	*	*	*	*										
		Electromagnetic Theory		*	*											
		Electrical	*	*	*											

	IIIrd	Instrumentation														
		Electronic Devices	*	*	*											
		Network Analysis and Synthesis	*	*	*	*								*		
		Simulation Lab-I	*	*	*	*	*									
		Self Study /GD Seminar		*	*		*	*	*	*		*	*	*		
4	**Semester - IVth**	Energy,Ecology ,Environment and Society						*	*		*				*	
		Digital Electronics	*	*											*	
		Signals and System	*	*	*											
		Analog Communication	*	*	*	*										
		Electronic Measurement and Instrumentation	*	*	*											
		Simulation Lab-II			*	*	*							*		
		Industrial Training-I		*	*		*	*	*	*	*		*	*		
5	**Semester -Vth**	Linear Control Systems		*	*	*	*									
		Digital Signal Processing Digital Signal Processing		*	*	*			*							
		CMOS Design		*	*											
		Power Electronics					*									
		Instrumentation Systems	*													
		Data Compression & Cryptography	*													
		Advanced Sensors	*	*		*					*				*	
		Industrial Training-I	*	*	*	*										
6	**Semester VIth**	Microcontroller & Microprocessor	*	*	*	*										
		Biomedical Instrumentation	*	*	*	*										
		Instrumentation in	*	*	*	*										

		Aerospace and Navigation														
		Reliability Engineering	*	*	*	*		*	*	*						
		Digital Image & Video Processing	*	*	*	*										
		Speech and Audio Processing	*				*	*	*	*				*		
		Introduction to MEMS	*	*	*	*	*			*						
		Bio-Medical ElectronicsDigital System Design using HDL Verilog	*	*												
		Minor Project	*	*	*	*	*									
7	**Semester VIIth**	Opto-Electronic Instrumentation	*	*	*	*	*	*	*							
		Analytical Instrumentation	*	*	*	*										
		Non-Conventional Energy Sources	*	*	*	*	*									
		Mixed Signal Design	*	*	*	*			*		*		*	*		
		Road Safety Engineering	*	*	*	*										
		Principles of Electronic Communications	*	*	*	*			*							
		Project Stage-I			*	*										
		Self Study/GD/Seminar		*	*	*		*	*							
8	**Semester VIIIth**	Transducers and Sensors	*	*											*	*
		Digital Control Systems	*												*	*
		Embedded systems	*				*				*		*	*		
		CAD of Digital Systems	*	*			*									
		Engineering and Acoustics		*	*				*							

	Project Stage-II	*	*		*								*	

(08) <u>Structure of Programme</u>: To fulfill the need of development of all the POs/ GAs, as per above mapping, the following semester wise programme structure are as under.

<u>[L= Lecture, T = Tutorials, P = Practical's & C = Credits]</u>

Total Credits*= 160

Structure of Undergraduate Engineering program:

S. No.	Course Category	Credits of the EI Curriculum
1.	Humanities and Social Sciences including Management	8
2.	Basic Sciences	17
3.	Engineering Sciences including workshop, drawing, basics of electrical/mechanical/computer etc.	19
4.	Professional Core Subjects	65
5.	Professional Subjects: Subjects relevant to chosen specialization/branch	17
6.	Open Subjects: Electives from other technical and/or emerging subjects	13
7.	Project work, seminar and internship in industry or elsewhere	21
8.	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	Non-credit
	Total	**160**

***Definition of Credit:**

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (Lab)/week	1 Credit

(09) Scheme of Exanimation (Electronics and Instrumentation Engineering) Academic Year 2019-20

I SEMESTER

S. No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	BEBSC-101	Mathematics-I	60	30	10	-	-	100	3		-	3
2	BEBSC-202	Engineering Physics	60	30	10	30	20	150	2	1	2	4
3	BEESC-203	Basic Computer Engineering	60	30	10	30	20	150	3	-	2	4
4	BEESC-204	Basic Mechanical Engineering	60	30	10	30	20	150	2	-	2	3
5	BEESC-205	Basic Civil Engineering & Mechanics	60	30	10	30	20	150	3	-	2	4
6	BEHSMC-206	Language Lab	-	-	-	30	10	40	-	-	2	1
7	BELC-107	Self Study / GD Seminar					10	10			2	1
		Total	**300**	**150**	**50**	**150**	**100**	**750**	**13**	**1**	**12**	**20**

Electronics and Instrumentation Engineering

II SEMESTER

S. No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	BEBSC-201	Mathematics-II	60	30	10	-	-	100	3		-	3
2	BEBSC-102	Engineering Chemistry	60	30	10	30	20	150	3		2	4
3	BEHSMC-103	English for Communication	60	30	10	30	20	150	3	-	2	4
4	BEESC-104	Basic Electrical Engineering	60	30	10	30	20	150	2	-	2	3
5	BEESC-105	Engineering Graphics	60	30	10	30	20	150	2	1	2	4
6	BEESC-106	Manufacturing Practices	-	-	-	30	10	40	-	-	2	1
7	BELC-207	Industrial Training					10	**10**	**-**	**-**	**2**	**1**
		Total	**300**	**150**	**50**	**150**	**100**	**750**	**13**	**1**	**12**	**20**

Electronics and Instrumentation Engineering
III SEMESTER

S. NO.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments /Quiz	End Sem. Practical & Viva	Practical Record /Assignment / Quiz / Presentation		L	T	P	
1	BEA-301	Mathematics -III	60	30	10			100	3		-	3
2	EIA-302	Electromagnetic Theory	60	30	10			100	3		-	4
3	EIA-303	Electrical Instrumentation	60	30	10	30	20	150	2		2	3
4	EIA-304	Electronic Devices	60	30	10	30	20	150	3		2	4
5	EIA-305	Network Analysis and Synthesis	60	30	10	30	20	150	2		2	4
6	EIA-306	Simulation Lab-I				30	20	50			2	1
7	EIA-307	Self Study /GD Seminar					50	50			2	1
		TOTAL	**300**	**150**	**50**	**120**	**130**	750	13		10	20

Electronics and Instrumentation Engineering

SEMESTER-IV

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments /Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	BEA-401	Energy,Ecology ,Environment and Society	60	30	10	-	-	100	3		-	3
2	EIA-402	Digital Electronics	60	30	10	30	20	150	2	1	2	4
3	EIA-403	Signals and System	60	30	10	30	20	150	3		2	4
4	EIA-404	Analog Communication	60	30	10	30	20	150	2	1	2	4
5	EIA-405	Electronic Measurement and Instrumentation	60	30	10	30	20	150	3		2	4
6	EIA-406	Simulation Lab-II				30	20	50			2	1
7	EIA-407	Industrial Training-I	To be completed anytime during Third/Fourth semester. Credit to be added in fith semester									
		TOTAL	**300**	**150**	**50**	**150**	**100**	**750**	**13**	**2**	**10**	**20**

Electronics and Instrumentation Engineering

SEMESTER-V

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments /Quiz	End Sem. Practical & Viva	Practical Record /Assignment / Quiz / Presentation		L	T	P	
1	EIA-501	Linear Control Systems	60	30	10	30	20	150	2	1	2	4
2	EIA-502	Digital Signal Processing	60	30	10	30	20	150	2	1	2	4
3	EIA-503	CMOS Design	60	30	10	30	20	150	2	1	2	4
4	EIA-504	Program Elective-I	60	30	10	-		100	3	1	0	4
5	EIA-505	Open Core Elective - I	60	30	10	-		100	3	1	0	4
6	EIA-506	Industrial Training-I				150	100	250			4	2
	TOTAL		**300**	**150**	**50**	**240**	**160**	**900**	**12**	**5**	**10**	**22**

Program Elective-I	EIA-504(A) Power Electronics	EIA-504(B) Instrumentation Systems
Open Core Elective - I	EIA-505(A) Data Compression & Cryptography	EIA-505(B) Advanced Sensors

Electronics and Instrumentation Engineering

SEMESTER-VI

S. No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	EIA-601	Microcontroller & Microprocessor	60	30	10	30	20	150	2	1	2	4
2	EIA-602	Biomedical Instrumentation	60	30	10	30	20	150	2	1	2	4
3	EIA-603	Program Elective-II	60	30	10			100	3	1	0	4
4	EIA-604	Program Elective-III	60	30	10	-		100	3	0	0	3
5	EIA-605	Open Core Elective - II	60	30	10	-		100	3	0	0	3
6	EIA-606	Minor Project	-	-	-	180	120	300	-	-	4	2
	TOTAL		**300**	**150**	**50**	**240**	**160**	**900**	**13**	**3**	**8**	**20**

Program Elective-II		
EIA-603	(A) Instrumentation in Aerospace and Navigation	(B) Reliability Engineering
Program Elective-III		
EIA-604	(A) Digital Image & Video Processing	(B) Speech and Audio Processing
Open Core Elective - II		
EIA-605	(A) Introduction to MEMS	(B) Digital System Design using HDL Verilog

Electronics and Instrumentation Engineering

SEMESTER-VII

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	EIA-701	Opto-Electronic Instrumentation	60	30	10	30	20	150	3	0	2	4
2	EIA-702	Analytical Instrumentation	60	30	10	30	20	150	3	0	2	4
3	EIA-703	Program Elective-IV	60	30	10			100	3	0	0	3
4	EIA-704	Open Core Elective - III	60	30	10		-	100	3	0	0	3
6	EIA-705	Project Stage-I	-	-	-	120	80	200	-	-	10	5
7	EIA-706	Self Study /GD/Seminar					200	200			2	1
	TOTAL		**240**	**120**	**40**	**180**	**320**	**900**	**12**	**0**	**16**	**20**

Program Elective-IV		
EIA-703	(A) Non-Conventional Energy Sources	(B) Mixed Signal Design
Open Core Elective - III		
EIA-704	(A) Road Safety Engineering	(B) Principles of Electronic Communications

Electronics and Instrumentation Engineering

SEMESTER-VIII

S.No.	Subj Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	EIA-801	Transducers and Sensors	60	30	10	30	20	150	3	0	2	4
3	EIA-802	Program Elective-V	60	30	10			100	3	0	0	3
4	EIA-803	Open Core Elective - IV	60	30	10	-		100	3	0	0	3
6	EIA-804	Project Stage-II	-	-	-	240	160	400	-	-	16	8
	TOTAL		**180**	**90**	**30**	**270**	**180**	**750**	**9**	**0**	**18**	**18**

Program Elective-V		
EIA-802	(A) Digital Control Systems	(B) Embedded systems
Open Core Elective - IV		
EIA-803	(A) CAD of Digital Systems	(B) Engineering and Acoustics

(10) Course Content

SEMESTER- I

BEBSC-101 Mathematics-I

BEBSC-101	Mathematics-I	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:-

The Preamble of this foundational course is to review mathematical concepts already learnt in higher secondary. This course will also introduce fundamentals of mathematical functions, derivatives and aspects of calculus to students. This course deep understanding of matrix, differential equations, Sequences and series, Vector Space as well as a strong sense of how useful the subject can be in other disciplines of learning.

Course Outcome:-

Course work is designed to provide students the opportunity to learn key concepts of mathematical functions, key concepts of matrix , Vector Spaces as well as fundamentals and applications of integral calculus.

Unit-I Calculus (10Hrs):

Rolle's theorem, Mean Value theorems, Expansion of functions by Mc. Laurin's and Taylor's for one variable; Taylor's theorem for function of two variables, Partial Differentiation, Maxima & Minima (two variables), Method of Lagrange's Multipliers.

Unit-II Integral (6 Hrs):

Definite Integral as a limit of a sum and Its application in summation of series; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas, Multiple Integral, Change the order of the integration, Applications of multiple integral for calculating area and volumes of the curves.

Unit-III Sequences and series (6 Hrs):

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Unit-IV Vector Spaces (6 Hrs):

Vector Space,Vector Sub Space, Linear Combination of Vectors, Linearly Dependent, Linearly Independent, Basis of a Vector Space, Linear Transformations.

Unit-V Matrices (10 Hrs):

Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem and its applications to find inverse.

References:-

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition,Pearson, Reprint, 2002.

2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BEBSC-102 Engineering Chemistry

BEBSC-102	Engineering Chemistry	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:

1. To acquire knowledge about hardness of water and importance of water in industrial purpose.
2. To understand the concept of molecular spectroscopy.
3. To gain the knowledge of about polymeric material and biodegradable substances.
4. To understand the mechanism of lubricant and properties of lubricant.

Course Outcomes:

1. Develop innovative methods to produce soft water for industrial use.
2. Identify the structure of unknown / new compounds with the help of spectroscopy.
3. Substitute metal with conducting polymers and produce cheaper biodegradable polymers to reduce environmental pollution.
4. Apply their knowledge for use and protect to industrial and domestic equipment.

UNIT-I Atomic and molecular structure (6Hrs)

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. water treatment- Introduction, hardness of water, Units of hardness, disadvantage of hard water, scale and sludge formation in boilers, boilers troubles.

UNIT-II Spectroscopic techniques and applications (10Hrs)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

UNIT-III Intermolecular forces and potential energy surfaces (6Hrs)

Ionic, dipolar and van Der Waals interactions. Lubricant-Introduction, mechanism of lubricant, classification of lubricant, properties of lubricating oils.

UNIT-IV Use of free energy in chemical equilibria (10Hrs)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. High Polymers-Introduction, nomenclature, types of polymerization, classification of polymers, plastics-important, thermo-plastic resins and thermo setting resin,

UNIT-V Periodic properties (10Hrs)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

REFRENCES:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane Fundamentals of Molecular Spectroscopy, by C. N. Banwell
3. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.
4. Physical Chemistry, by P. W. Atkins
5. Engg. Chemistry jain.jain
6. Engg. Chemistry shashi chawla.

BEBSC-102	**Engineering Chemistry**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

LIST OF EXPERIMENTS:

1. Determination of surface tension and viscosity
2. Determination of chloride content of water
3. Determine the change of viscosity of given lubricating oil with change in temperature by Redwood Viscometer No. 1.
4. Determine the change of viscosity of given lubricating oil with change in temperature by Redwood Viscometer No. 2.
5. To determine the flash and fire point of given lubricating oil by Cleveland's open cup apparatus.
6. To determine the flash and fire point of given lubricating oil by Abel's closed cup apparatus.
7. To determine the flash and fire point of given lubricating oil by Pensky Marten's apparatus.
8. To determine the total hardness of given water sample by titrating it against EDTA solution using EBT as an indicator.

Laboratory Outcomes:

a. Estimate rate constants of reactions from concentration of reactants/products as a function of time
b. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
c. Synthesize a small drug molecule and analyse a salt sample

BEHSMC-103 English for Communication

BEHSMC-103	English for Communication	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles

1. To enhance Professional competence in reading, writing, listening and speaking.
2. To modify the tactic of providing information about the language by using several techniques.
3. To minimize the Grammar Translation Method of ELT by replacing it with Direct Learning Method.
4. To Introduce Communicative Method of ELT and focusing the teaching pedagogy to the student-centered learning rather than the teacher-centered learning.
5. To develop the skills to master three major forms of communications which are vital in academic and professional settings namely professional presentations, interviews and group communications respectively.
6. To provide a deep insight of techniques for delivering effective presentations, appealing job interviews, and actively participating in various forms of group communication.

Course Outcomes

At the end of this course students will have:

CO1: Ability to design a language component or process to meet desired need within Realistic, Constraints such as economic, environmental, social, political, ethical Scenario.
CO2: Ability to analyze the usage of English words in different contexts.
CO3: An understanding of technical and academic articles' comprehension.
CO4: The ability to present oneself at multinational levels knowing the type of different Standards of English

UNIT-I Identifying Common errors in writing (6 Hrs):

Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure.

UNIT-II Vocabulary building and Comprehension (6 Hrs)

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension.

UNIT-III Communication: (10 Hrs)

Introduction, Meaning and Significance, Process of Communication, Oral and Written Communication, 7 c's of Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students, nonverbal communication.

UNIT-IV Developing Writing Skills (10 Hrs)

Planning, Drafting and Editing, Precise Writing, Précis, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, Progress Report.

UNIT-VBusiness Correspondence (10 Hrs):

Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for writing Resume, Calling/ Sending Quotation, Order, Complaint, E-mail and Tender.

References:-

1. 'Technical Communication : Principles and practice', Meenakshi Raman and Sangeeta Sharma (Oxford)
2. 'Effective Business Communication', Krizan and merrier (Cengage learning)
3. 'Communication Skill, Sanjay Kumar and pushlata, OUP2011
4. "Practical English Usage Michael Swan OUP, 1995.
5. "Exercises in spoken English Parts I-III CIEFL, Hyderabad, Oxford University Press
6. On writing well, William Zinsser, Harper Resource Book 2001.
7. Remedial English Grammar, F.T. Wood,Macmillan2007.

BEHSMC-103	**English for Communication**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

List of Experiments:-

1. Listening Comprehension.
2. Pronunciation, Intonation, Rhythm
3. Practicing everyday dialogues in English
4. Interviews.
5. Formal Presentation

BEESC-104 Basic Electrical Engineering

BEESC-104	**Basic Electrical Engineering**	**2L:0T:0P**	**2 credits**	**2Hrs/Week**

Course Preambles:

Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context and to provide students the working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.

Course Outcomes

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations

Unit-I Electrical circuit elements (10 Hrs):

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-delta transformation, nodal methods, Superposition of a theorem, Thevenin theorem, Norton theorem.

Unit-II AC Circuits (10 Hrs):

Representation of Sinusoidal waveforms –Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally 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.

Unit-III Magnetic circuit (6 Hrs)

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Unit-IV Machines (10 Hrs):

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.

Unit-V Components of LT Switchgear: (6 Hrs)

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.

Reference's: -

1. Ritu Sahdev, "Basic Electrical Engineering",
2. S. Singh, P.V. Prasad, "Electrical Engineeri
3. D. P. Kothari and ElectricalI.J.Nagrath,Engineering","Basic Tat
4. D. C. Kulshreshtha, "Basic Electrical Engine
5. E. Hughes, "Electrical and Electronics Techn
6. 6. S. Bobrow, "Fundamentals of Electrical En
7. 7.V. D. Toro, "Electrical Engineering Fundamen

BEESC-104	**Basic Electrical Engineering**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

Laboratory Preambles:

1. Read and demonstrate the rating of basic equipments used in electrical engineering
2. Connections of different components as per the rules
3. Application different components in electrical field

Laboratory Outcomes

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.

List of 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.

BEESC-105 Engineering Graphics and Design

BEESC-105	Engineering Graphics and Design	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles

PREAMBLES:-

1. Increase ability to communicate with people.
2. Learn to sketch and take field dimensions.
3. Learn to take data and transform it into graphic drawings.
4. Learn basic Auto Cad skills.
5. Learn basic engineering drawing formats.
6. Prepare the student for future Engineering positions.

OUTCOMES: -

Student's ability to hand letter will improve.

1. Student's ability to perform basic sketching techniques will improve.
2. Students will be able to draw orthographic projections and sections.
3. Student's ability to use architectural and engineering scales will increase.
4. Students ability to produce engineered drawings will improve
5. Student's ability to convert sketches to engineered drawings will increase.
6. Students will become familiar with office practice and standards.
7. Students will become familiar with Auto Cad two dimensional drawings.
8. Students will develop good communication skills and team work.

UNIT-I Introduction to Engineering Drawing (10 Hrs):

Principles of Engineering Graphics and their significance, usage of Drawing instruments, Lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales –Plain, Diagonal and Venire Scales;

UNIT-II Orthographic Projections **(10 Hrs):**

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Projections of Regular Solids those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale

UNIT-III Sections and Sectional Views of Right Angular Solids (6 Hrs):

Prism, Cylinder, Pyramid, Cone –Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only).

UNIT-IV Isometric Projections: **(6 Hrs):**

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, Conventions;

UNIT-V Overview of Computer Graphics: (10 Hrs):

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Objects, Isometric Views of lines, Planes, Simple and compound Solids; Customization & CAD Drawing consisting of 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 tolerance.

References:-

1.Bhatt N.D., Paschal 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, TMH Publication

4.Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

5.CAD Software Theory and User Manuals

BEESC-105	**Engineering Graphics and Design**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

List of Experiments:-

1. Sketching and drawing of geometries and projections based on above syllabus
2. Term work: A min. of 30 hand drawn sketches (on size A4 graphic sketch Book) plus 5 CAD-printouts on size A4 sheets plus 10 sheets of size A2 or 6 sheets of size A1, (50% marks to be allotted for this record + 25% marks for attendance +25%marks for Teachers Assessment

BEESC-106 Manufacturing Practices

BEESC-106	Manufacturing Practices	0L:0T:1P	1 credits	2Hrs/Week

Course Preambles:

1. To understand process of cutting shaping.
2. To understand working principles for various machining processes.
3. To understand construction, working and applications of various machine tools.
4. To learn basic set up, working and applications of a few important non conventional machining processes to get hand on experience on various machine tools.

Course Outcomes:

1. The students will be able to understand the details about machines used in production.
2. The students will be able to understand the mechanics behind metal cutting.
3. The students will be able to understand the finishing and super finishing processes.
4. The students will be able to understand the Physics of material removal behind the various non-conventional machining processes.

Manufacturing is fundamental to the development of any engineering product. The course on Engineering Workshop Practice is intended to expose engineering students to different types of manufacturing / fabrication processes, dealing with different materials such as metals, ceramics, plastics, wood, glass etc. While the actual practice of fabrication techniques is given more weightage, some lectures and video clips available on different methods of manufacturing are also included.

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Carpentry
5. Plastic molding, glass cutting
6. Metal casting
7. Welding (arc welding & gas welding), brazing

List of Experiments:-

1. Carpentry Shop Experiment To Make a T-LAP joint with wood Pieces
2. Machine Shop Experiment To Perform Knurling on Iron Rod
3. WELDING SHOP (LAP Joint) , Tools, Accessories, Diagram And Explanation
4. SHEET METAL SHOP (Square Tray) , Parts, Accessories, Diagram And Explanation
5. FITTING SHOP (Make a Joint) , Parts, Accessories, Diagram And Explanation
6. CARPENTRY SHOP (T-Lap Joint) , Cutting Tools, Accessories, Diagram and Explanation
7. MACHINE SHOP (the lathe machine) , Parts, Accessories, Diagram and Explanation

BELC 207 Industrial Training

BELC 207	**Industrial Training**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.

BEBSC-201 Mathematics-II

BEBSC-201	**Mathematics-II**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles

1. To introduce the basic concepts required to understand, construct, solve and interpret differential equations.
2. 2. To teach methods to solve differential equations of various types.
3. 3. To give an ability to apply knowledge of mathematics on engineering problems

Course Outcomes

The students will be able to :

1. Classify differential equations according to certain features.
2. Solve first order linear equations and nonlinear equations of certain types and interpret the solutions.
3. Understand the conditions for the existence and uniqueness of solutions for linear differential equations
4. Solve second and higher order linear differential equations with constant coefficients and construct all solutions from the linearly independent solutions
5. Find series solutions about ordinary and regular singular points for second order linear differential equations.
6. Solve initial value problems using the Laplace transform.
7. Solve systems of linear differential equations with methods from linear algebra

Unit - I Ordinary Differential Equations I (6 Hrs):

Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations.

UNIT-II Ordinary differential Equations II (6 Hrs):

Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Unit III Partial Differential Equations (10 Hrs)

Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

Unit IV Functions of Complex Variable (10 Hrs)

Functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, theorem ,Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral

Unit V Vector Calculus (10 Hrs)

Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems.

References : -

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig , Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. Dip Rima, Elementary Differential Equations and Boundary Value Problems, 9th End., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Codington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Inca, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BEBSC- 202 Engineering Physics

BEBSC- 202	Engineering Physics	2L:1T:0P	3 credits	3Hrs/Week

Course Preambles

- A comprehensive, high-quality education in the physical sciences
- A flexible curriculum with multiple concentrations that allows students to tailor their education according to their specific interests
- The opportunity to experience the excitement of scientific discovery through direct participation in faculty research
- An increased awareness of the physical processes in the surrounding world
- The essential knowledge and analytical, mathematical and computational tools with which to pursue post-graduate education in a variety of physics-related and other fields
- The foundation and practical skillsets for eventual success in any of a broad array of careers
- The motivation for a lifelong love of learning

Course Outcomes

- Explain fundamentals of quantum mechanics and apply to one dimensional motion of particles.
- To formulate and solve the engineering problems on Electromagnetisman ability to design a system, component, or process to meet desired needs within realistic constraints.
- To analyze the structural properties of elemental solids
- To calculate electronic conductivity of solids
- To apply distribution function to quantum and classical systems
- To evaluate thermal properties of solids using statistical approch
- To classify magnetic and supercounducting behavior of solids

Unit I Relativistic Mechanics: (6 Hrs):

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.

Unit II Solid state & Nuclear physics (10 Hrs):

Free electron theory of metals, Qualitative discussion of Kronig-penny model and origin of energy bands. Intrinsic and Extrinsic Semiconductors. V-I Characteristics of PN junction diode, Zener diode, Hall-effect.

Introduction to Nuclear Physics , Static properties of Nucleus,Nuclear liquid drop model, Nuclear Shell Model, Linear particle accelelerator, Cyclotron, Betatron, Bainbridge mass sprectrograph.

Unit III Quantum Mechanics: (6Hrs):

Introduction to Quantum mechanics, Wave particle duality, Matter waves, Particle velocity, Phase velocity , Group velocity and their relation. Heisenberg's Uncertainty Principle. Time-dependent and time-independent Schrodinger wave equation, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Unit IV Wave Optics: (10 Hrs):

Interference :Coherent sources, Interference in uniform and wedge shaped thin films, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power of grating, Rayleigh's criterion of resolution. Resolving power of grating and Prism.

Unit V Fibre Optics & Lasers: Fibre Optics(10 Hrs):

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.

Reference Books: -

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw 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)

BEBSC- 202	Engineering Physics	0L:0T:1P	1 credits	2Hrs/Week

List of Experiments: -

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 energy band gap of a given semiconductor material.

4. To determine the plank's constant with help of photocell.

5 .Resolving Power of Telescope.

6 .V-I Charecteristics of P-N Junction diode.

7. Zener diode characteristics.

8. To determine the dispersive power of prism.

BTEESC-203 Basic Computer Engineering

BTEESC-203	Basic Computer Engineering	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:-

- Successfully practice computer engineering to serve state and regional industries, government agencies, or national and international industries.
- Work professionally in one or more of the following areas: computer hardware and software design, embedded systems, computer networks and security, system integration, and electronic design automation.
- Achieve personal and professional success with awareness and commitment to their ethical and social responsibilities, both as individuals and in team environments.
- Maintain and improve their technical competence through lifelong learning, including entering and succeeding in an advanced degree program in a field such as engineering, science, or business.

Course Outcome:-

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

Unit –I Computer: (6Hrs):

Definition, Classification, Organization i.e. CPU, register, Memory & Storage Systems, I/O Devices, and System & Application Software.Computer application E-Business, Bio-Informatics, health Care, Remote Sensing & GIS, Meteorology and, Computer Gaming, Multimedia and Animation etc.

Unit –II Introduction to Algorithms (6 Hrs):

Complexities and Flowchart, Introduction to Programming, Categories of Programming Languages, Program Design, Programming Paradigms, Characteristics or Concepts of OOP, Procedure Oriented Programming VS object oriented Programming. Introduction to C, Character Set, Tokens, Precedence and Associativity, Program Structure, Data Types, Variables, Operators, Expressions, Statements and control structures, I/O operations, Array, Functions,

Unit – III Computer System Overview (10 Hrs):

Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization.Operating system overview- Preambles and functions, Evolution of Operating System. - Computer System Organization- Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

Unit IV Computer Networking (10 Hrs):

Introduction, Goals, OSI Model, Functions of Different Layers. Internetworking Concepts, Devices, TCP/IP Model. Topology, Introduction to Internet, World Wide Web, E• commerce Computer Security Basics: Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Different types of attacks like Money Laundering, Information Theft, Cyber Pornography, Email spoofing, Denial of Service (DoS), Cyber Stalking, ,Logic bombs, Hacking Spamming, Cyber Defamation, Security measures Firewall,

Unit V Data base Management System (10 Hrs):

Introduction, File oriented approach and Database approach, Data Models, Architecture of Database System, Data independence, Data dictionary, DBA, Primary Key, Data definition language and Manipulation Languages. Cloud computing: definition, cloud infrastructure, cloud segments or service delivery models (IaaS, PaaS and SaaS), cloud deployment models/ types of cloud (public' private, community and hybrid clouds), Pros and Cons of cloud computing

Reference books:

1. Introduction of computers: Peter Norton, TMH
2. Object oriented programming with c++ :E.Balaguruswamy,TMH
3. Object oriented programming in C++: Rajesh k.shukla ,Wiley India
4. Computer network: Andrew Tananbaum,PHI
5. Data base management system,Korth,TMH
6. Operating system-silberschatz and Galvin-Wiley India

BTEESC-203	**Basic Computer Engineering**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

List of Experiment:-

1. Study of input and output devices of computer systems .
2. Write a program of addition, subtract, multiplication and division by using C.
3. Write a program to check weather a number is prime or not.
4. Study of various types of Operating System.
5. Study and practice of basic Linux commands-ls, cp, mv, rm, chmod kill, ps etc.
6. Design color coding of straight & crossover cable.
7. Installation of oracle 10g. Also create a employee table.

BEESC-204 Basic Mechanical Engineering

BEESC-204	Basic Mechanical Engineering	2L:0T:0P	2 credits	2Hrs/Week

Course Preamble:

- To provide a comprehensive knowledge of basic mechanical systems.
- Basic concepts from mechanical engineering sciences,
- Basic concepts I.C Engine
- Modern engineering tools (machine-tools, laboratory instrumentation, Working principle of steam Engine), and related subjects to design mechanical engineering components

Course Outcome:

- After successful completion of this course students will able to
- To describe and use basic engineering concepts
- principles and components of mechanical equipment
- measuring & testing method of physical quantities
- Assessment of boiler component.

Unit I Materials (6 Hrs):

Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbon diagram. Alloy steels their applications. Mechanical properties like strength, hardness, toughness ductility, brittleness , malleability etc. of materials , Tensile test- Stress-strain diagram of ductile and brittle materials ,

Unit II Measurement (10 Hrs):

Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier caliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set. Production Engineering: Elementary theoretical aspects of production processes like casting, carpentry, welding etc Introduction to Lathe and Drilling machines and their various operations.

Unit III Fluids (6Hrs):

Fluid properties pressure, density and viscosity etc. Types of fluids , Newton's law of viscosity , Pascal's law , Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps .

Unit IV Thermodynamics (10Hrs):

Thermodynamic system, properties, state, process, Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy.

Steam Engineering: Classification and working of boilers, mountings and accessories of boilers, Efficiency and performance analysis, natural and artificial draught, steam properties, use of steam tables.

Unit V Reciprocating Machines (10 Hrs) :

Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams and its efficiency, working of Two stroke & Four stroke Petrol & Diesel engines. Working principle of compressor.

References : -

1- Kothandaraman & Rudramoorthy, Fluid Mechanics & Machinery, New Age . 2- Nakra & Chaudhary , Instrumentation and Measurements, TMH.

3- Nag P.K, Engineering Thermodynamics , TMH .

4- Ganesan , Internal Combustion Engines, TMH .

5- Agrawal C M, Basic Mechanical Engineering ,Wiley Publication. 6- Achuthan M , , Engineering Thermodynamics ,PHI.

BEESC-204	**Basic Mechanical Engineering**	**0L:0T:1P**	**2 credits**	**2Hrs/Week**

List of Experiments:-

1- Study of Universal Testing machines.

2- Linear and Angular measurement using, Micrometer, Slip Gauges, Dial Gauge and

3- Study of Lathe Machine.

4- Study of Drilling Machines.

5- Verification of Bernoulli's Theorem.

6- Study of various types of Boilers.

7- Study of different IC Engines.

8- Study of different types of Boilers Mountings and accessories.

BEESC-205 Basic Civil Engineering & Mechanics

BEESC-205	**Basic Civil Engineering & Mechanics**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preamble:

The goal of this Engineering Mechanics course is to expose students to problems in mechanics as applied to plausibly real-world scenarios. Problems of particular types are explored in detail in the hopes that students will gain an inductive understanding of the underlying principles at work; students should then be able to recognize problems of this sort in real-world situations and respond accordingly.

The civil engineering program will serve Connecticut and the nation by providing a quality engineering education that enables students to enter a profession that can improve the civil infrastructure, and economic welfare. Our civil engineering program will maintain a strong emphasis on undergraduate education with the goal that our program will be recognized for quality instruction in civil engineering analysis and design

Course Outcomes:

- Demonstrate knowledge of various surveying methods.
- Conduct a chain survey.
- Conduct a compass survey.
- Conduct levelling survey and be able to do RL calculations.
- Demonstrate knowledge of properties of various building materials.
- Draw free body diagrams and determine the resultant of forces and/or moments.
- Determine the centroid and second moment of area of sections.
- Apply laws of mechanics to determine efficiency of simple machines with consideration of friction.
- Analyse statically determinate planar frames.

Unit I Building Materials & Construction (10 Hrs)

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing. Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

Unit II Surveying & Positioning (10 Hrs):

Introduction to surveying Instruments – levels, theodolites , plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal levelling .

Unit III Basics of Engineering Mechanics covering (10 Hrs):

Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces ,Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

Unit IV Centroid and Centre of Gravity covering (10 Hrs):

Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

Unit V Friction covering (10 Hrs):

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames

Reference Books:

1. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Prasad I.B., Applied Mechanics, Khanna Publication.
3. Punmia, B.C., Surveying, Standard book depot.
4. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI

BEESC-205	**Basic Civil Engineering & Mechanics**	**0L:0T:2P**	**1 credits**	**2Hrs/Week**

List of Experiments:-

1. To perform traverse surveying with prismatic compass, check for local attraction and determine corrected bearings and to balance the traverse by Bowditch's rule.

2. To perform leveling exercise by height of instrument of Rise and fall method.

3. To measure horizontal and vertical angles in the field by using Theodolite.

4. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.

5. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.

6. To determine the Compressive Strength of brick .

7. To determine particle size distribution and fineness modulus of course and fine Aggregate.

8. To verify the law of Triangle of forces and Lami's theorem.

9. To verify the law of parallelogram of forces.

10. To verify law of polygon of forces

11. To find the support reactions of a given truss and verify analytically.

12. To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.

13. To determine the moment of inertia of fly wheel by falling weight method.

14. To verify bending moment at a given section of a simply supported beam.

BEHSMC-206 Language Lab and Seminar

BEHSMC-206	**Language Lab and Seminar**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

Course Preamble: This course intends to impart practical training in the use of English Language for

Communicative purposes and aims to develop students' personality through language Laboratory.

Topics to be covered in the Language laboratory sessions:

1. **1.** Introducing oneself, family, social roles.
2. 2.Public Speaking and oral skills with emphasis on conversational practice, extempore speech, JAM(Just a minute sessions), describing objects and situations, giving directions, debate, telephonic etiquette.
3. Reading Comprehension: Intensive reading skills, rapid reading, and reading aloud (Reading material to be selected by the teacher).
4. To write a book review. Standard text must be selected by the teacher.
5. Role plays: preparation and delivery topic to be selected by teacher/faculty.

BELC–207 Self Study / GD Seminar

BELC–207	**Self-Study / GD Seminar**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

Course Preamble

To improve the mass communication and convincing / understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves. Evaluation will be done by assigned faculty based on group discussion and power point presentation.

Course Outcomes:

- Analytical thinking
- Lateral thinking
- constructive argument
- Communication skill
- Presentation of views

Students will discuss the course related and interdisciplinary topics for problem solving. They will improve the mass communication and convincing / understanding skills about subject and their related problem in a group of students.

MATHEMATICS-III

BEA-301

BEA-301	Mathematics-III	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

1. Mathematics fundamental necessary to formulate, solve and analyze engineering problems.
2. An understanding of Regula-Falsi and Laplace Transform to solve real world problems.
3. An understanding of Linear Algebra through matrices.
4. An understanding of Complex integration.

Course outcomes:

1. Solve problems in engineering domain related to Linear Algebra using matrices.
2. Analyze and solve engineering problems using Laplace Series.
3. Analyze and solve engineering problems using Regula-Falsi.
4. Solve engineering problems using Complex Integration.

UNIT 1: (10 hours)

Numerical Methods: Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

UNIT 2: (7 hours)

Numerical Methods: Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.

UNIT 3: (10 hours)

Numerical Methods: Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation**.**

UNIT 4: (10hours)

Transform Calculus: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

UNIT 5: (5 hours)

Concept of Probability: Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.

2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.

7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book

8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed.

Electromagnetic Theory

EIA-302

EIA-302	**Electromagnetic Theory**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preambles:

1.To introduce students with different coordinate systems.

2. To familiarize the students with the different concepts of electrostatic, magneto static and time varying electromagnetic systems.

3.To expose the students to the ideas of electromagnetic waves and structure of transmission line**.**

Course Outcomes:

1. Define and recognize different co-ordinate systems to describe the spatial variations of the physical quantities dealt in electromagnetic field theory as they are functions of space and time.Apply different techniques of vector calculus to understand different concepts ofelectromagnetic field theory.

2. Explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields (Field intensity, Flux density etc.) in different media using the fundamental laws.

3. Determine the electromagnetic force exerted on charged particles, current elements, working principle of various electric and electromagnetic energy conversion devices are based on this force.

Unit I (10H)

Review of vector calculus: orthogonal coordinate systems, gradient, divergence and curl. Laplacian operator for scalar and vectors. Vector integral and differential identities and theorems. Phasor representation of harmonic variation of scalar and vectors Static electric fields, Columb's law, electric flux density and electric field intensity, permittivity, dielectric constant, field of distributed charges in free space, potential function, Laplace's and Poisson's equations, electric dipole, stored electric energy density.

Unit II (10H)

Solution of Laplace's equations in systems of dielectric and conducting boundaries, uniqueness theorem, two dimensional boundary condition problems, solution by symmetry, conformal transformation of functions, image theory etc. fields in parallel wire, parallel plane and coaxial systems. Static currents and magnetic fields- flow of charge in conductive media, lossy

conductive medium, current density, specific conductivity, mobility, explanation of Ohm's law employing mobility. Magnetic effects of current flow, Biot-Savart's law in vector form magnetic field intensity, magnetic flux, and permeability, closed loop currents, Ampere's circuital law in integral and differential vector form, magnetic vector potential and related equations.

Unit III (10H)

Time varying fields – Faraday's law in integral and differential forms, displacement current concept, Maxwell's equations in differential and integral forms, wave equations in source free region electric and magnetic stored energy density, continuity equation, Poynting vector theorem. Time harmonic fields, r.m.s. phasor representation of field vectors, Maxwell's equations for TH field, average energy density, complex Poynting vecto..

Unit IV (6H)

Circular and elliptic polarization, resolution in terms of linear polarized waves and vice- versa. Plane waves in lossy medium, low loss dielectric, good conducting and ionized media, complex permittivity, loss tangent, skin depth, transmission line analogy.

Unit V (6H)

Reflection and refraction of plane waves at dielectric media and conducting Surfaces, Brewster's angle, total internal reflection, resultant fields and power flow in both media. Frequency dispersive propagation, phase velocity and group velocity.

References:

1. Mathew N.O Sadiku: Elements of Electromagnetic, Oxford University Press

2. William H. Hayt: Engineering Electromagnetic, TMH.

3. John D. Kraus: Electromagnetics, Mc. Graw Hill.

4. Jordan Balmian: Electromagnetic wave and Radiating System, PHI.

5. David K. Cheng: Electromagnetic Fields and Wave, Addison Wesley.

6. Ramo, Whinnerry and VanDuzzer " Fields and waves in communication electronics ", Wiley 1984

7. Harrington RF, "Electromagnetic fields" Mc Graw Hill

Electrical Instrumentation

EIA-303

EIA-303	Electrical Instrumentation	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

1. To understand concepts of various electrical and electronic measuring instruments.
2. To familiarize with different electromechanical and electronic instruments.
3. To introduce instruments for power and energy measurements.
4. To explain instrument transformers and magnetic measurements.
5. To be able to measure different physical parameters with the help of AC bridges.

Course outcomes

1. Explain the working of different electromechanical indicating instruments.
2. Elucidate the concept of several AC bridges for inductance and capacitance
3. Describe basic working of instrument transformers.
4. Measure power and energy with the help of wattmeter and energy meter.
5. Describe the construction and working of various electronic instruments.

Unit I (10H)

Introduction to measurement: Definition, application and types of measurement System, Accuracy, Precision, sensitivity, Resolution, introduction to static and Dynamic Characteristics, Error and uncertainty analysis, Loading effect.

Unit II (10H)

Electrical measurement: Construction and operation of moving coil, moving iron, hot iron instrument-Ammeter & voltmeter, Theory and Operation of D'arsonval, Ballistic and vibration Galvanometer, instrument transformers. Extension of instrument ranges.

Unit III (10H)

R, L, C Measurement: Bridges: Measurement of resistance using Wheatstone bridge, Kelvin's double bridge, Loss of charge method, ohm meter, meggar Measurement of inductance and capacitance by A.C. bridges: Maxwell's bridge, Anderson bridge, Schering bridge, Hay's bridge, Wein's bridge, Shielding and grounding, Q meter.

Unit IV (6H)

Digital instruments: Advantages of digital instruments, Over analog instruments, D-A, A-D conversion, Digital voltmeter, Ramp type DVM, Integrating DVM, successive approximation DVM, frequency meter. Display devices: CRO-construction and working, deflection, triggering & synchronization, Time, Phase, Frequency measurement. Storage CRO, Sampling CRO, Digital Oscilloscope. Displays (LED, LCD and seven segment etc)

Unit V (6H)

Signal generator: Function generator, sweep frequency generator, Pulse and square wave generator, Wave Analysers, Harmonic Distortion Analyser, Spectrum Analyser, frequency counter.

References:

1.Modem Electronics Instrumentation, Albert D. Cooper, PHI.

2. Electrical and electronic Measurement by A.K.Sawhney

3. Measurement system by Doebelin

4. Electronic Instrumentation – Kalsi – TMH

EIA-303	**Electrical Instrumentation**	**0L:0T:2P**	**1 credits**	**2 Hrs/Week**

Experiments (Expandable): All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/ drafted on paper.
Step 2: The designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER).
Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.
Step 4: The bread board circuit should be fabricated on PCB prepared on PCB machine.

1. Experiments to enhance knowledge pertaining to this subject.

Electronic Devices

EIA-304

EIA-304	**Electronic Devices**	**03L:0T:0P**	**3 credits**	**3 Hrs/Week**

Course Preambles:

1. To understand operation of semiconductor devices.
2. To understand DC analysis and AC models of semiconductor devices.
3. To apply concepts for the design of Regulators and Amplifiers
4. To verify the theoretical concepts through laboratory and simulation experiments.
5. To implement mini projects based on concept of electronics circuit concepts.

Course Outcomes:

1. Understand the current voltage characteristics of semiconductor devices,
2. Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation,
3. Design and analyze of electronic circuits,
4. Evaluate frequency response to understand behavior of Electronics circuits.

Unit-I (10H)

Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodicLattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon.

Unit-II (10H)

Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors.

Unit-III (10H)

Generation and recombination of carriers Poisson and continuity equation P-N junction characteristics, I-Vcharacteristics, and small signal switching models; Avalanche breakdown,Zener diode, Schottky diode.

Unit-IV (6H)

Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model,MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell.

Unit-V (6H)

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography,etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

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. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford Univ.Press, 2011.

EIA-304	**Electronic Devices**	**0L:0T:2P**	**1 credits**	**2 Hrs/Week**

List of Experiments (Expandable):

All experiments (wherever applicable)

.Step 1: Circuit should be designed / drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. V-I characteristics of various Diodes (p-n, Zener, Varactor, Schottky, Tunnel, Photodiode etc)
2. Characteristics of Transistors (BJT and FET)

3. Study of Power electronic devices (Diac, Triac, SCR, Power MOSFET, IGBT etc

Network Analysis and Synthesis

EIA-305

EIA-305	**Network Analysis and Synthesis**	**2L:1T:0P**	**3 credits**	**2 Hrs/Week**

Course Preambles:

1. To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques.
2. To introduce students with the fundamental concepts in graph theory.
3. To analyze circuits in time and frequency domain.
4. To explain concepts of driving point and transfer functions, poles and zeroes of network functions and their stability.
5. To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.
6. To synthesize the network using passive elements.

Course Outcomes:

1. Apply concepts of electric network topologydes, branches, loops to solve circuit problems including the use of computer simulation.
2. Understand the basic concepts of graph and analyze the basic electrical circuits using graph theory.
3. Apply time and frequency concepts of analysis.
4. Understand various functions of network and also the stability of network.
5. Learn the various parameters and the irinterrelationship, able to solve numericals with series, cascade, parallel connection using two port parameters.
6. Synthesize the network using passive elements**.**

Unit-I (10H)

Node and Mesh Analysis, matrix approach of network containing voltage and current sources,and reactances, source transformation and duality. Network theorems: Superposition, reciprocity,Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem asapplied to AC. circuits.

Unit-II(10H)

Trigonometric and exponential Fourier series: Discrete spectra andsymmetry 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.

Unit-III(10H)

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.

Unit-IV(6H)

Transient behavior, concept of complex frequency, Driving points and transfer functions polesand zeros of emittance function, their properties, sinusoidal response from pole-zero locations convolution theorem and Two four port network and interconnections.

Unit-V(6H)

Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Text/Reference Books

1. Van, Valkenburg.; "Network analysis" ; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994
3.A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

EIA-305	**Network Analysis and Synthesis**	**0L:0T:2P**	**1credits**	**2 Hrs/Week**

List of experiments

1.To Verify Thevenin Theorem.

2. To Verify Superposition Theorem.

3. To Verify Reciprocity Theorem.

4. To Verify Maximum Power Transfer Theorem.

5. To Verify Millman's Theorem.

6. To Determine Open Circuit parameters of Two Port Network.

7. To Determine Short Circuit parameters of a Two Port Network.

8. To Determine A,B, C, D parameters of a Two Port Network

9. To Determine h parameters of a Two Port Network

10. To Find Frequency Response of RLC Series Circuit.

11. To Find Frequency Response of RLC parallel Circuit.

SIMULATION LAB

EIA-306

EIA-306	SIMULATION LAB	0L:0T:2P	1 credits	2Hrs/Week

Course Preambles:

1. Basic course for designing of PCB using software. The major objective is to select and use appropriate.
2. Test equipment and This is a procedures from a wide range of possibilities; to analyse and interpret test results and measurements on electric base.
3. Circuits, in terms of theoretical models, to predict the performance of electric circuits from device characteristics and to design .
4. Electronic printed circuit board for a specific application using industry standard software.

Course outcomes

1. Able to analyze the fabrication processes of printed circuit boards.
2. Perform the chemical and mechanical processes by using negative/positive masks
3. Students are able to define how to operate the software and hardware (i.e. drilling, etching/routing, milling equipments as well as the developer and etcher machines)

PCB DESIGNING SOFTWARE Study of circuit simulation software (any one- TINA-PRO/ PSPICE/ CIRCUIT MAKER/ GPSIM/ SAPWIN etc).

Overview and Study of the key features and applications of the software. Application of the software in the field of Electronic Devices, Electronic Instrumentation and Network Analysis Design, Optimization and simulation of

1. Basic Electronic circuits (examples rectifiers, clippers, clampers, diode, transistor characteristics etc). 2. Transient and steady state analysis of RL/ RC/ RLC circuits, realization of network theorems.

3. Use of virtual instruments built in the software. Study of PCB layout software Overview and use of the software in optimization, designing and fabrication of PCB pertaining to above circuits simulated using above simulation software or other available. Students should simulate and design the PCB for at least two circuits they are learning in the current semester.

EIA-307

GD / SS

EIA-307	**Self-study /GD Seminar (Internal Assessment)**	**0L:0T:2P**	**1 credits**	**2Hrs/Week**

Course Preambles:

1. Collecting data and Breeding fresh ideas and taking inputs from a particular group
2. Perception of common people on a particular topic
3. Identify a solution to a specific problem or issue
4. Selecting candidates after their written test for hiring in a company
5. Selecting candidates for admission in an educational institute

Course outcomes

1. Understanding of the Subject: During a group discussion, it is being constantly assessed how deep your knowledge is about the chosen topic and how well you are aware of each aspect of that topic

2. Team Work: While working in an organization or even during management studies, it is very important to work as a part of the team in a given project or any assignment. This skill is really important and it is evaluated through GD as well. You not only put your own points but also listen to others and then come to a concluding point. This shows how ready you are to listen to other's opinion, give value to that and also at the same time stand by your own convictions.

Objective of GD and seminar is to improve the mass communication and convincing / understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves. Evaluation will be done by assigned faculty based on group discussion and power point presentation

Energy, Ecology, Environment and Society

BEA-401

BEA-401	**Energy, Ecology, Environment & Society**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preamble:

The program is highly relevant to both the public sector and the private sector. Knowledge about sustainable development, energy and environmental challenges are expected to increase sharply in the future. Such social change also requires new ways of thinking. In-depth knowledge in these areas will therefore be on high demand. The multidisciplinary approach of this master will undoubtedly strengthen the relevance of social science graduates for both public and private secto

Course Outcomes

1. Knowledge of energy carriers, energy technologies, energy challenges, digitalization and ICT related to energy system integration.
2. Advanced knowledge of transition theory and other theoretical perspectives on politics and policy changes.
3. Advanced knowledge of national and international energy politics and policy.
4. Advanced knowledge of the challenges associated with a low carbon transition, and how this affects both societal structures and individual lives in an intersectional perspective.
5. Advanced knowledge of strategies and actions necessary for a low carbon transition

UNIT -1(10H)

Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.

UNIT-2(10H)

Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation

UNIT-3(10H)

Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.

UNIT-4(6H)

Water Pollution– Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent. Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

UNIT-5(6H)

Society, Ethics & Human values– Impact of waste on society. Solid waste management Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

REFERENCES:

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.

2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.

3. Raynold, GW "Ethics in information Technology"; Cengage.

4. Svakumar; Energy Environment & Ethics in society; TMH

5. AK De "Environmental Chemistry"; New Age Int. Publ.

6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.

7. Bala Krishnamoorthy; "Environmental management"; PHI

8. Gerard Kiely, "Environmental Engineering" ; TMH

9. Miller GT JR; living in the Environment Thomson/cengage

10. Cunninghan WP and MA; principles of Environment Sc; TMH

11. Gandhiji M.K.- My experiments with truth

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Digital Electronics

EIA-402

EIA-402	Digital Electronics	2L:1T:0P	3 Credits	3Hrs/Week

Course Preamble:

1. To understand number representation and conversion between different representation in digital electronic circuits.
2. To analyze logic processes and implement logical operations using combinational logic circuits.
3. To understand characteristics of memory and their classification.
4. To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines.
5. To understand concept of Programmable Devices, PLA, PAL, CPLD and FPGA and implement digital system using VHDL**.**

Course Outcomes

1. Develop a digital logic and apply it to solve real life problems.
2. Analyze, design and implement combinational logic circuits.
3. Classify different semiconductor memories.
4. Analyze, design and implement sequential logic circuits.
5. Analyze digital system design using PLD.

Unit-I (10H)

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and DeMorgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

Unit-II (10H)

MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half andFull Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU.

Unit-III (10H)

Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of

synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulsetrain generator, Pseudo Random Binary Sequence generator, Clock generation.

Unit-IV (6H)

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.

Unit-V (6H)

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL ,Data type sand objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
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. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

EIA-402	**Digital Electronics**	**0L:0T:1P**	**1 Credits**	**2Hrs/Week**

List of Experiments:

1. Study of various basic gates(IC 7400,7402,7404,7486,7408 etc.) & to verify its truth table.

2. Verify the operation of NAND and NOR gates as universal gates.

3. Study of half and full adder / half and full subtractor& verify its truth table.

4. Study of 4:1 and 8:1 MUX and verify its truth table.

5. Study of 2x4 and 4x8 DEMUX and verify its truth table.

6. Verify truth table of SR, JK, T and D flip-flops using IC 7473, IC 7474 and IC7476.

7. Study the decade counter using IC7490 and verify its operation using truth table.

8. Study the 4-bit ripple counter using IC7493 and verify its operation. Plot the waveform at output of each flip

Signals and System

EIA-403

EIA-403	**Signals and System**	**3L:0T:0P**	**3 Credits**	**3Hrs/Week**

Course Preamble:

1. To introduce students the concept and theory of signals and systems needed in electronics and telecommunication engineering fields.

2. To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domain

Course Outcomes

1. Understand about various types of signals and systems, classify them, analyze them, and perform various operations on them,

2. Understand use of transforms in analysis of signals and system in continuous and discrete time domain.

3. Observe the effect of various properties and operations of signals and systems.

Unit-I (10H)

Signals and systems as seen in everydaylife, and in various branches of engineering and science.Energy and power signals, continuous and discrete time signals, continuous and discreteamplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

Unit-II (10H)

Linear shift-invariant (LSI) systems, impulse response and step response, convolution, inputoutputbehavior with aperiodic convergent inputs. Characterization of causality and stability oflinear shift-invariant systems. System representation through differential equations anddifference equations.

Unit-III (10H)

Periodic and semi-periodic inputs to an LSI system, the notion of a frequencyresponse and itsrelation to the impulse response, Fourier series representation, the Fourier Transform,convolution/multiplication and their effect in the frequency domain, magnitude and

phaseresponse, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and theDiscrete Fourier Transform (DFT). Parseval'sTheorem.The idea of signal space and orthogonal Bases.

Unit-IV(6H)

The Laplace Transform, notion ofeigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution todifferential equations and system behavior.The z-Transform for discrete time signals and systems- eigen functions, region of convergence,z-domain analysis.

Unit-V (6H)

State-space analysis and multi-input, multi-output representation. The state-transition matrix andits role. The Sampling Theorem and its implications- Spectra of sampled signals.Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and itseffects. Relation between continuous and discrete time systems.

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.

EIA-403	**Signals and System**	**0L:0T:2P**	**1 Credits**	**2 Hrs/Week**

List of Experiments (Extendable):

1. Demonstration of diff. Signals and their properties.
2. Demonstration of sampling /reconstruction of signals and spectral analysis using dft.
3. Analysis of Fourier properties of signals.
4. Convolution and correlation of signals.
5. Demonstration of salient properties of signals.

Analog Communication
EIA-404

EIA-404	**Analog Communication**	**2L:1T:0P**	**3 Credits**	**3Hrs/Week**

Course Preamble:

1. The fundamentals of basic communication system, types of noise affecting communication system and noise parameters.

2. Need of modulation, modulation processes and different amplitude modulation schemes

3. Different angle modulation schemes with different generation and detection methods.

4. Various radio receivers with their parameters.

5. Need of sampling and different sampling techniques.

Course Outcomes

1. Understand different blocks in communication system and how noise affects communication using different parameters.

2. Distinguish between different amplitude modulation schemes with their advantages, disadvantages and applications..

3. Analyze generation and detection of FM signal and comparison between amplitude and angle modulation schemes.

4. Identify different radio receiver circuits and role of AGC.

5. Sample analog signal and recover original.

Unit-I (10H)

Review of signals and systems, Frequency domain representation of signals, Principles ofAmplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Unit-II (10H)

Review of probability and random process. Gaussian and white noise characteristics,Noise inamplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation.

Unit-III (10H)

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.

Unit-IV (6H)

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion.Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Unit-V (6H)

Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

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.

EIA-404	**Analog Communication**	**0L:0T:2P**	**1 Credits**	**2 Hrs/Week**

List of Experiments:

1.Analysis of AM Modulation and Demodulation Techniques (Transmitter and Receiver), Calculation of Parameters.

2. Analysis of FM Modulation and Demodulation (Transmitter and Receiver) and Calculation of Parameters .

3. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.

4. Study of Super-heterodyne Receiver and Characteristics of Radio Receiver.

5. To Construct Frequency Multiplier Circuit and to Observe the Waveform

6. Study of AVC and AFC.

7. Study of PLL chip (566) and its use in various systems.

Electronic Measurements and Instrumentation

EIA-405

EIA-405	**Electronic Measurements and Instrumentation**	**3L:0T:0P**	**3 Credits**	**3Hrs/Week**

Course Preamble:

1. To provide basic knowledge about the various sensors and data acquisition systems applied in Wireless sensor network.

2. To provide fundamental concepts of control system such as mathematical modeling, time response and frequency response.

Course Outcomes

3. To develop concepts of stability and its assessment criteria.

1. Students will be able to explain principle of operation for various sensors.

2. Students will be able to describe functional blocks of data acquisition system.

3. Students will be able to find transfer functions for given system**.**

Unit-I (10H)

Measurement and Error: Accuracy and Precision, Sensitivity, Linearity, Resolution, Hysterisis, Loading Effect. Measurements of Current, Voltage, Power and Impedance: DC and AC Ammeter, DC VoltmeterChopper type and solid-state, AC voltmeter using Rectifier, Average, RMS, Peak Responding voltmeters, Multi-meter, Power meter, Bolometer and Calorimeter.

Unit-II (10H)

Cathode Ray Oscilloscope (CRO): Different parts of CRO, Block diagram, Electrostatic focusing, Electrostatic deflection, Post deflection acceleration, Screen for CRTs, Graticules, Vertical and Horizontal deflection system, Time base circuit, Oscilloscope Probes, Applications of CRO, Special purpose CROsMulti input, Dual trace, Dual beam, Sampling, Storage (Analog and Digital), Oscilloscope.

Unit-III (10H)

AC Bridges: Maxwell's bridge (Inductance and Inductance-Capacitance), Hay's bridge, Schering bridge (High voltage and Relative permittivity), Wein bridge, Wagner earth detector, Impedance measurement by Q-meter. Non-Electrical Quantities (Transducer): Classification of Transducers, Strain gauge, Displacement Transducer- Linear Variable Differential Transformer (LVDT) and Rotary Variable Differential Transformer (RVDT), Temperature Transducer- Resistance Temperature Detector (RTD), Thermistor, Thermocouple, Piezo-electric transducer, Optical Transducer- Photo emissive, Photo conductive, Photo voltaic, Photo-diode, Photo Transistor, Nuclear Radiation Detector.

Unit-IV (6H)

Signal generator & Display: Signal and Function Generators, Sweep Frequency Generator, Pulse and Square Wave Generator, Beat Frequency Oscillator, Digital display system and indicators, Classification of Displays, Display devices, Light Emitting diodes(LED), Liquid Crystal Display(LCD).

Unit-V (6H)

Digital Measurement and Instruments: Advantages of Digital Instrument over Analog Instrument, Digital-to-analog conversion (DAC) - Variable resistive type, R-2R ladder Type, Binary ladder, Weighted converter using Op-amp and transistor, Practical DAC. Analog-to-digital Conversion (ADC) -Ramp Technique, Dual Slope Integrating Type, Integrating Type (voltage to frequency), Successive Approximations, digital voltmeters and multi-meters, Resolution and sensitivity of digital meter, PLC structure, principle of operation, response time and application.

References:

1. H. S. Kalsi: Electronics Instrumentation, TMH.

2. K. Sawhney: Instrumentation and Measurements, Dhanpat Rai and Co.

3. Helfric and Cooper: Modern Electronic Instrumentation and Measurement Techniques; Pearson.

EIA-405	**Electronic Measurements and Instrumentation**	**0L:0T:2P**	**1 Credits**	**2Hrs/Week**

List of Experiments: All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step2: The designed/drafted circuit should be simulated using Simulation Software Grading System 2015-16

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Study of CRO and Function Generator.

2. Displacement measurement by LVDT.

3. Force measurement by strain gauge.

4. Measurement of Capacitor, Self-induction using Q-meter.

5. Temperature measurement by thermistor, RTD and thermocouple.

6. Optical Transducer- Photo conductive, Photo voltaic, Photo-diode, Photo-Transistor

7. Design of digital to analog converter.

8. PLC operation and applications (for example: relay, timer, level, traffic light etc.)

Simulation Lab-II

EIA-406

EIA-406	Simulation Lab-II	0L:0T:2P	1 Credits	2Hrs/Week

Course Preamble:

1. To impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT,etc., for Engineering Simulation.

2. To know various fields of engineering where these tools can be effectively used to improve the output of a product.

3. To impart knowledge on how these tools are ued in Industries by solving some real time problems using these tools..

Course Outcomes

1. The student will be able to appreciate the utility of the tools like ANSYS or FLUENT in solving real time problems and day to day problems.

2. Use of these tools for any engineering and real time applications.

3. Acquire knowledge on utilizing these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their employment.

ADVANCED SIMULATION/ VERIFICATION SOFTWARE Study of simulation/ verification software (any one- LAB-VIEW/KTECHLAB/ GNU CIRCUIT ANALYSIS PACKAGE/ LOGISIM/ MULTISIM/ SCILAB etc)

Overview and Study of the key features and applications of the software.

Application of the software in the field of Electronic Circuits, Digital Electronics and Analog Communication. Design, Optimization, simulation and verification of

1. Electronic circuits (example amplifiers, oscillators etc).

2. Realization and verification of various digital electronic circuits (example logic gates, adders, subtractors etc)

3. Realization of various signals and communication link etc.

Students should simulate and verify at least six circuits they are learning in the current semester

EIA- 407

Industrial Training – I

EIA- 407	**Industrial Training – I**	**0L:0T:1P**	**1 Credits**	**2Hrs/Week**

Course Preamble:

What new skills will I learn or hope to learn during the internship? Some skills you may have the chance to develop include: operating office or computer equipment; handling a variety of situations simultaneously; organizing or analyzing data, records, or budgets; or improving teamwork, writing, and speaking abilities. Assignments and work environment will determine the types of skills developed.

Course Outcomes

1. Explore career alternatives prior to graduation.
2. Integrate theory and practice.
3. Assess interests and abilities in their field of study.
4. Learn to appreciate work and its function in the economy.
5. Develop work habits and attitudes necessary for job success.
6. Develop communication, interpersonal and other critical skills in the job interview process.
7. Build a record of work experience.
8. Acquire employment contacts leading directly to a full-time job following graduation from college.

1. Internship on area in Electronics filed .

Note- In this internship student should complete 90 Hr Internship on Electronics filed

SEMESTER -V

Linear Control Systems
EIA-501

EIA-501	Linear Control Systems	**2L:1T:0P**	**3 credits**	**2Hrs/Week**

Course Preambles:

1. To develop basic skills of utilizing mathematical tools needed to analyze and design classical
   linear control systems.
2. To understand and develop the state space representation of control systems.

Course Outcomes:

1. Understand the concept of the terms control systems, feedback, Mathematical modeling of Electrical and Mechanical systems.
2. Explain the time domain and frequency response analysis of control systems.
3. Acquire the knowledge of various analytical techniques used to determine the stability of control systems.
4. Able to understand the importance of design of compensators
5. Able to demonstrate controllability and observability of modern control systems.

UNIT-I (10H)

Introduction to Control Systems: Classification of control systems. Components of control systems, Feed-Back Characteristics, Effects of feedback - Mathematical modeling of Electrical and Mechanical systems, Transfer function, Transfer function of Potentiometer, synchro, AC servo motor, DC servo motor, Block diagram reduction technique, Signal flow graph, Mason's gain formula

UNIT-II (10H)

Time Domain Analysis: Standard test signals, Time response of first order systems, Transient response of second order system for unit step input, Time domain specifications, Steady state response, Steady state errors and error constants, Effects of P, PD, Pl and PID controllers.

UNIT-III (10H)

Stability Analysis in S-Domain: The concept of stability, Routh's stability Criterion, Absolute stability and relative stability, limitations of Routh's stability.
Root Locus Technique: The root locus concept, construction of root loci, Effects of adding poles and zeros on the root loci.

UNIT-IV(6H)

Frequency Response Analysis: Introduction to frequency response, Frequency domain specifications, Bode plot, Stability analysis from Bode plots, Determination of transfer function from the Bode Diagram, Polar Plots, Nyquist Plots, Stability Analysis, Gain margin and phase margin

Control System Design: Introduction - Lag, Lead and Lag-Lead Compensator design in frequency Domain

UNIT-V (6H)

State Space Analysis: Concepts of state, State variables and state model, Derivation of state models of linear time invariant systems - Controllable, Observable and Diagonal state models, State transition matrix, Solution of state equation, Concepts of Controllability and Observability.

Reference Book:

1. Nagrath I.J. & Gopal.M - Control System Engineering, Wiley Eastern, 2003.
2. B.C.Kuo - Automatic Control Systems, Wiley India edition, 7th Edition, 2002.
3. K.Ogata - Modern Control System, Prentice Hall of India, 4th edition, 2002.
4. N.C.Jagan - Control Systems, B.S Publications, 2nd edition,2008.

EIA-501	Linear Control Systems	**2L:1T:0P**	**3 credits**	**2Hrs/Week**

LIST OF EXPERIMENTS

1. Characteristics of DC Servomotor.

2. AC Position control system.

3. DC Position control system.

4. ON/OFF Temperature Control system.

5. Step response of second order system.

6. Characteristics of AC Servomotor.

7. Characteristics of synchro pair .

8. Frequency response analysis of LEAD compensating network

9. Frequency response analysis of LAG compensating network

10.Temperature control system using PID.

11. Level control system.

12. Step response and frequency response of a given plant

Digital Signal Processing
EIA-502

EIA-502	**Digital Signal Processing**	**2L:1T:0P**	**3 Credits**	**2Hrs/Week**

Course Preambles:
The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis DSP systems**.**

Course Outcomes:
At the end of this course students will demonstrate the ability to
1. Represent signals mathematically in continuous and discrete time and frequency domain
2. Get the response of an LSI system to different signals
3. Design of different types of digital filters for various applications

Unit-I(10H)
Introduction to Digital Signal Processing, Discrete time signals & systems, linear shift invariant systems, stability and causality, Linear-constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, properties of the Discrete Time Fourier transform (DTFT), Sampling and discrete time processing of continuous-time signals.

Unit-II(10H)
Applications of z-transforms, solution of difference equations of digital filters, System function, stability criterion, frequency response of stable systems, one sided Z-transform and its applications.

Unit-III(10H)
Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences. Discrete

Fourier Transforms: Properties of DFT: Fast Fourier Transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms. Inverse FFT.

Unit-IV (6H)
IIR DIGITAL FILTERS: Analog filter approximations - Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Bilinear transformation method, step & impulse invariance

techniques, Spectral Transformations, Realization of IIR digital filters - direct, canonic, cascade & parallel forms.

Unit-V(6H)

FIR DIGITAL FILTERS: Characteristics of FIR Digital Filters frequency response, Design of FIR Digital Filters using Window Techniques. Comparison of IIR and FIR filters, Realization of FIR digital filters direct, linear phase, cascade & parallel forms.

Text/Reference Books:

1. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH

2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.

3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997.

4. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.

5. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.

6. D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988.

EIA-502	**Digital Signal Processing**	**0L:0T:2P**	**1 Credits**	**2Hrs/Week**

List of Experiments (Extendable)

1. Generation, analysis and plots of discrete-time signals.

2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding

3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.

4. Computation and plots of z-transforms, verification of properties of z-transforms.

5. Computation and plot of DFT of sequences, verification of properties of DFT.

6. Implementation of various window design techniques (Rectangular, Bartlett, Hamming)

Program Elective-I
EIA-504(A) Power Electronics

EIA-503(A)	**Power Electronics**	**3L:1T:0P**	**4 Credits**	**2Hrs/Week**

Course Preambles:

1.To understand and acquire knowledge about various power semiconductor devices.

2.To prepare the students to analyze and design different power converter circuits.

Course Outcomes:
At the end of this course students will demonstrate the ability to
1. Build and test circuits using power devices such as SCR
2. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters,
3. Learn how to analyze these inverters and some basic applications.
4. Design SMPS.

UNIT-I (10H)

Characteristics of Semiconductor Power Devices: Thyristor, power MOSFET and IGBTTreatment should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs (discrete and IC based).Concept of fast recovery and schottky diodes as freewheeling and feedback diode.

UNIT-II (10H)

Controlled Rectifiers: Single phase: Study of semi and full bridge converters for R, RL, RLE and level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Effect of source impedance, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor.

UNIT-III (10H)

Choppers: Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper.

UNIT-IV (6H)

Single-phase inverters: Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter.

UNIT-V (6H)

Switching Power Supplies: Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, Load resonant converter – series loaded half bridge DC-DC converter. Applications: Power line disturbances, EMI/EMC, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS. Separately excited DC motor drive. P M Stepper motor Drive.

Text /Reference Books:

1. Muhammad H. Rashid, “Power electronics” Prentice Hall of India.
2. Ned Mohan, Robbins, “Power electronics”, edition III, John Wiley and sons.
3. P.C. Sen., “Modern Power Electronics”, edition II, Chand& Co.
4. V.R.Moorthi, “Power Electronics”, Oxford University Press.
5. Cyril W., Lander,” Power Electronics”, edition III, McGraw Hill.
6. G K Dubey, S R Doradla,: Thyristorised Power Controllers”, New Age International Publishers. SCR manual from GE, USA.

EIA-504(B)
Instrumentation Systems

EIA-503(B)	**Instrumentation Systems**	**3L:1T:0P**	**4 Credits**	**2Hrs/Week**

Course Preambles:

1. To expose the students to various sensors and transducers for measuring mechanical quantities.
2. To understand the specifications of sensors and transducers.
3. To learn the basic conditioning circuits for various sensors and transducers.
4. To introduce advances in sensor technology.

Course Outcomes:

1. Familiar with both static and dynamic characteristics of measurement system.
2. Familiar with the principle and working of various sensors and transducers.
3. Able to design signal conditioning circuit for various transducers.
4. Able to identify or choose a transducer for a specific measurement application

UNIT –I (10H)

Measurement of Motion: Angular velocity (speed) measurement: Electrical methods like DC and AC Tacho generators, eddy current (drag cup) Tachometers and Stroboscopic method.
Acceleration measurements: Seismic displacement, velocity, acceleration pick-ups, electromagnetic and electro dynamic type of velocity transducers, piezoelectric transducers, deflection type of accelerometer, bonded strain gauge accelerometer, and piezoelectric accelerometers.

UNIT-II (10H)
Measurement of force, Torque and Temperature: Basic methods of force measurement: characteristics of elastic force transducers, load cells. **Various types of Torque measurement**: absorption, transmission, stress, deflection type. **Measurement of Temperature:** Laws of thermocouples, Thermocouple circuits, reference junction considerations ice bath reference junction special materials, configurations and techniques (cooled thermocouples, pulsed thermocouples, and multifunction thermocouples) and radiation thermometers.

UNIT – III (10H)

Measurement of flow: Classification of flow meters, head flow meters like orifice plate, venture tube, flow nozzle and pitot tube. Rotameter, electromagnetic flow meter, positive displacement meter, hot wire and hot film anemometer, mass flow measurements, rotor torque mass flow meter.

UNIT-IV (6H)

Measurement of liquid level: Electrical methods: Resistive, inductive and capacitive methods, capacitive variable area method, capacitive voltage divider method, capacitive variable dielectric constant method. Measurement of liquid level using gamma rays, ultrasonic method and float
Measurement of humidity: Absolute Humidity, relative humidity, hygrometers (resistive and capacitive hygrometer), Microwave refractometer , Aluminum oxide hygrometers.
Measurement of PH Electrodes: Station Glass and Calomel Electrodes, installation of PH meters.

UNIT V (6H)
Measurement of sound: Sound level meter microphones with their types like carbon and capacitive microphone, dynamic microphone, inductive microphone, piezo electric microphone. Pressure response of capacitive microphone

Referance Book:

1. C.S.Rangan, G R Sarma & V S N Mani, Instrumentation Devices and Systems-TMH, 2nd Edition 2004

2.B.Nakra & Chowdhari, Instrumentation Measurement and Analysis, TMH, 2nd Edition

3. D.V.S.Murthy, Transducers and Instrumentation. PHI, 1995 4. John P. Bentley, Principles

of Measurement Systems, 3rd Edition, Pearson Education, 2000.

4. Doebelin E.O, Measurement Systems - Application and Design, 4th Edition, McGraw-Hill .

5. Patranabis D, Principles of Industrial Instrumentation, 2nd Edition, Tata McGraw Hill, New Delhi, 1997.

Open Core Elective - I
EIA-505(A)
Data Compression & Cryptography

EIA-505(A)	Data Compression & Cryptography	3L:1T:0P	4 Credits	3 Hrs/Week

Course Preambles:
This course will cover the concept of security , types of attack experienced, encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression

Course Outcomes
At the end of this course the student will have the knowledge of Plaintext, cipher text, RSA and other cryptographic algorithm, Key Distribution, Communication Model, Various models for data compression

Unit-I (10H)
Introduction to the Concept of Security: Introduction, The Need of Security, Security Approaches, Principal of Security, Types of Attacks.

Unit- II (10H)
Cryptographic Techniques: Introduction, Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks .

Unit-III (10H)
Computer-based Symmetric Key Cryptographic Algorithms: Introduction, Algorithm Types and Models, An Overview of Symmetric Key Cryptography, Data Encryption Standard(DES), International Data Encryption Algorithm(IDEA), RC5, Blowfish, Advanced Encryption Standard(AES), Differential and Linear Cryptanalysis.

Unit- IV (6H)
Computer-based Asymmetric Key Cryptographic Algorithms: Introduction, Brief History of Asymmetric Key Cryptography, An Overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some other Algorithms.

Unit- V (6H)
Public Key Infrastructure (PKI): Introduction, Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography standard(PKCS), XML, PKI and Security .

References: 1.Behrouz A. Forouzan and D. Mukhopadhyay- Cryptography & Network Security, 2nd Edition - 1 st reprint 2010, McGraw Hill, New Delhi.
2.WadeTrapple, Lawrence C. Washington- Introduction to Cryptography with coding Theory, 2nd Edition pearson Educat

EIA-505(B) Advanced Sensors

EIA-505(B)
Advanced Sensors

EIA-505(Ab)	**Advanced Sensors**	**3L:1T:0P**	**4 Credits**	**3 Hrs/Week**

Course Preambles:

1. To introduce the principles of Advanced sensors
2. To introduce the construction and applications of Advanced sensors

Course Outcomes

1. Develop an understanding of need multi sensor and recent trends in technology
2. Explore Smart sensors working principle
3. Discuss the techniques for MEMS, NANO and Chemical sensors techniques
4. To understand the basic operation involved in Robotics, fiber optics and Boi sensors

UNIT – I

Sensor Fundamentals: Basic sensor technology and sensor system. **Application Consideration**: Sensor characteristics, system characteristics, instrument selection, data acquisition and readout, and installation.

UNIT –II

Biosensors: Overview, applications and of origin of biosensor, bio receptor molecules, transduction mechanisms in biosensors, application range of biosensors, and future prospects. **MEMS and NANO sensors:** Micro electromechanical systems (MEMS), Micromachining, Biomedical Applications, NANO sensors and carbon NANO tubes.

UNIT – III

Smart Sensors: Technology fundamentals and applications. **Electromagnetism in sensing**: Introduction to electromagnetism and inductance in sensor application, magnetic field sensors and applications.

UNIT – IV

Chemical Sensors: Introduction to semiconductor gas detectors, ion selective electrodes, Conduct metric sensors, and mass sensors. **Fiber optic sensors:** Fiber optic sensors for the measurement of temperature, pressure, displacement, turbidity and pollution.

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UNIT – V

Robotics sensors: Introduction, characteristics and types of sensors, touch or tactile sensors, binary and analog sensors, proximity sensors, types of proximity sensors, contact and non-contact proximity sensors, robotic vision.

1. Sensor Technology Handbook by Jon Wilson Newness Publication Elsevier
2. Pallas-Areny R and Webster JG, "Sensors and Signal Conditioning," Wiley India
3. Gardener, "Micro sensors, MEMS and Smart Devices," Wiley India
4. Khazan AD, "Transducers and their Elements – Design and Applications," Prentice Hall
5. Patranabis D, "Sensors and Transducers," Prentice Hall
6. Middlehook S and Audet SA, "Silicon Sensors," Academic Press
7. Dorf RC, "Sensors, Nanoscience, Biomedical engineering and instruments," CRC Press
8. Zanger H and Zanger C, "Fiber optics Communication and other applications," Macmillan publishing
9. Joshi RM, "Biosensors," ISHA Books
10. Webster JG, "Medical Instrumentation, Application and Design," Wiley India

Industrial Training-I
EIA-506

EIA-506	**Industrial Training-I (Minor)**	**0L:0T:4P**	**2 credits**	**2Hrs/Week**

Course Preamble:

1. To expose the students to actual working environment **Electronics & Instrumentation** engineering and enhance their knowledge and skill from what they have learned in the classes.
2. Another purpose of this program is to instill the good qualities of integrity, responsibility and self-confidence.
3. To persue students with the electrical field ethics and rules in terms of the society.

Course Outcomes:

Ability to communicate efficiently. Acquired to be a multi-skilled engineer with good technical knowledge of electrical and electronics components and their processing, management, leadership and entrepreneurship skills. Ability to identify, formulate and model problems and find engineering solution based on a systems approach.

Students must observe following points to enrich their learning in electrical engineering during industrial training:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance system.
- Costing system.
- Stores and purchase systems.
- Roles and responsibilities of different categories of personnel.
- Customer services.

-Problems related to various areas of Work etc.

- Layout if any

To be submitted : The students has to submit the power point presentation of minimum15 slides of the training performed(comprising of points stated above) along with the original certificate of training performed with proper seal and signature of the authorized person.

Semester – VI

Microcontroller & Microprocessor
EIA-601

EIA-601	**Microcontroller & Microprocessor**	**2L:1T:0P**	**3 credits**	**2Hrs/Week**

Course Preamble

1. To be able to understand in detail about 8086 microprocessor architecture, programming and interfacing.
2.To be able to understand about 8051 microcontroller architecture, and programming.

Course Outcomes

1. Acquire the knowledge of Architecture of 8086, writing assembly language programming for different applications.
2.Explain types of microcontrollers and their applications

UNIT-I (10H)

Microprocessor: Architecture of 8086 - Segmented memory, Addressing modes, Instruction set, Minimum and maximum mode operations.

UNIT-II (10H)

Introduction to Programming: Assembly language programming, Assembler directives, Simple programs using assembler, Strings, Procedures, Macros timing.

UNIT-III (10H)

Interfacing to Microprocessor: Memory and I/O interfacing, A/D and D/A interfacing, 8255(PPI),
Programmable Internal Timer (8253), Keyboard and display interlace, Interrupts of 8086.

UNIT- IV (6H)

Micro Controller Architecture: Types of Micro Controllers, 8051 MC - Architecture input / output pins, Ports and circuits, Internal and external memories, Counters and timers, Serial data input / output, Interrupts & timers.

UNIT-V (6H)

Introduction to Programming: Basic Assembly Language Programming, instruction cycle, Addressing modes, 8051 instruction set, Classification of instructions. Simple programs.

Reference Book:

1. Douglas. V. Hall microprocessors and Interfacing -Tata McGraw Hill -Revised 2nd Edition,

2006.
2. Krishna Kant - microprocessors and Microcontrollers - Architecture, Programming and System Design 8085, 8086, 8051, 8096, Prentice-Hall India - 2007.
3. Kenneth. J. Ayala–The 8051 Microcontroller Architecture Programming and Applications", Thomson publishers, 2nd Edition, 2007.
4. Waiter A. Triebel & Avtar Singh - The 8088 and 8086 Microprocessor -Pearson Publishers, 4th Edition, 2007.

EIA-601	**Microcontroller & Microprocessor**	**0L:0T:2P**	**1 credits**	**2Hrs/Week**

Experiment List

1.To study development tools/environment for ATMEL/PIC microcontroller programme and Architecture.
2. Write an assembly language program to add, subtract, multiply, divide 16 bit data by Atmel microcontroller.
3. An assembly language program to generate 10 KHz frequency using interrupts on P1.2.
4. Study and analyze the interfacing of 16 x 2 LCD.
5. Study of implementation, analysis and interfacing of seven segment display.
6. Study of implementation of steeper motor angle control.
7. Study of implementation of DC Motor control using PWM method.
8. Study and observation of Position control of Servo Motor.
9. Study of Programming and Transmission and Reception of data through serial port.
10. To study implementation and programming of Pressure measurement.
11. To study implementation and programming of Temperature measurement.
12. Study and analysis of interfacing of graphical LCD using PIC Microcontroller.
13. To interface PWM based voltage regulator using PIC Microcontroller.
14. Study and interface of IR (RC5 Protocol) and RF Communication using PIC Microcontroller

EIA-602
Biomedical
Instrumentation

EIA-602	Biomedical Instrumentation	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble

1. To provide students with an understanding of various medical instruments and latest techniques used in the hospital for diagnostic purpose.
2. To learn and understand electrical hazards of medical instruments and patient's safety.

Course Outcomes

1. Describe different general devices used in biomedical applications.
2. Explain instruments for recording Bio-potentials.
3. Explain different techniques and related instruments for measuring blood pressure, blood flow and heart sounds.
4. Describe radiography and explain recent biomedical instruments.
5. Describe electrical hazards, safety in hospital design.

UNIT-I (10H)

Introduction to Bio medical Instrumentation: General characteristics of medical instrumentation like linearity, range, frequency response, signal to noise ratio and stability. Amplifiers for Bio medical Applications: Differential, Carrier amplifiers. Recorders and display devices for Bio medical applications. General features of ink jet, thermo sensitive and optical recorders. General features of display devices for bio signals. Data acquisition and display using micro computers

UNIT-II (10H)

Electro Cardiograph(ECG) recording system: Block Schematic diagram of ECG machine, Amplifiers and circuits for ECG, ECG Leads, Noise problems and their elimination.

Electro Encephalography (EEG): Block schematic diagram of EEG recording system, General features of different blocks, Specification of EEG amplifiers, Qualitative requirements. 10 -20 electrode placement system, resting rhythms and sleep stages.

Electro Myography (EMG): Block schematic diagram of EMG recording system. EMG amplifiers. Design considerations of EMG amplifiers. Data display for EMG.

UNIT-III (10H)

Blood pressure and Blood Flows: Electronic Techniques for indirect and direct measurement of blood pressure. Measurement of blood flow by Electromagnetic, Doppler and Plethysmo graphic methods

Phonocardiography: Origin of heart sounds, Phonocardiography instrumentation consisting of microphone, filters and signal conditioners.

UNIT-IV (6H)

Introduction to Radiography: Physical properties of X-Rays, principles of generation of X-Rays. Radiation energy distribution, collimators and grids, fluoroscopy, and image intensifiers.

Recent Trends: Medical imaging, X-rays, laser applications, ultrasound scanner, echo cardiography, CT scan MRI/NMR, Cine angiogram, color Doppler systems, Holter monitoring, endoscopy.

UNIT-V (6H)

Electrical hazards during Bio electric monitoring: Safety codes and Standards, Micro and Macro shock and their physiological effects. Leakage currents and protection by the use of isolation transformers, Equipotential grounding and earth free monitoring. Electrical factors in Hospital Design: Electrical power supply systems in a Hospital building. Proper installation and grounding for providing safe patient electrical environment.

Reference Book:

1. Leslie Cromwell, Fred J. Weibell and Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", 2nd Edition, Prentice Hall, New Delhi, 1998.
2. John G. Webstar, Medical instrumentation -Application & Design, John Wiley & Sons Inc., 3rd Edition, 2003.
3. R.S. Khandpur, Hand Book of Biomedical Instrumentation, Tata McGraw Hill Publishing Company Ltd., 2nd Edition, New Delhi, 2003
4. Joseph J.Carr and John M.Brown, Introduction to Biomedical Equipment Technology, Pearson Education, 2001.
5. L. A. Geddes, Principles of Applied Bio-Medical Instrumentation, John Wiley and Sons, New York, USA, 1975.
6. Geddes L. A. and Baker L. E., "Principles of Applied Biomedical Instrumentation", 3rd Edition, John Wiley, New York, 1989.
7. Richard Aston, "Principles of Bio-medical Instrumentation and Measurement", Merril Publishing Company, New York, 1990

EIA-602	Biomedical Instrumentation	0L:0T:2P	1 credits	2 Hrs/Week

Experiment List

1. Design of pre amplifiers to acquire bio signals along with impedance matching circuit using suitable IC's
2. Design of ECG Amplifiers with appropriate filter to remove power line and other artifacts.
3. Design of EMG amplifier

4. Design a suitable circuit to detect QRS complex and measure heart rate
5. Design of frontal EEG amplifier
6. Design of EOG amplifier to detect eye blink
7. Design a right leg driven ECG amplifier.
8. Design and study the characteristics of optical Isolation amplifier
9. Design a Multiplexer and Demultiplexer for any two biosignals.
10. Measurement of pulse-rate using Photo transducer.

Program Elective-II
EIA-603(A)
Instrumentation in Aerospace and Navigation

EIA-604(A)	**Instrumentation in Aerospace and Navigation**	**3L:0T:0P**	**3 credits**	**3 Hrs/Week**

Course Preamble:

1. To expose the students to the field of aerospace engineering
2. To impart basic knowledge of its navigation instrumentation

Course Outcomes:

1. To understand the basics of aerospace and navigation
2. To know the technical aspects of this subject
3. To know about various troubles in aircrafts

UNIT-I (10H)
Introduction To Aviation: History of aviation and space flight anatomy of airplane and space vehicle with emphasis on control surfaces. Airfoil nomenclature, basics of aerodynamics to illustrate lift and drag, types of drag, finite wings, swept wings, flaps Airplane performance, thrust, power, rate of climb, absolute and service ceiling, range and endurance.

UNIT-II (10H)
Aircraft Instrumentation: Basic of engine instruments, capacitive fuel content, gauges, standard atmosphere, altimeters, aneroid, radio altimeters. Aircraft compass, remote indicating magnetic compass, rate of climb indicator, pilot static system, air speed indicator, mach meters, integrated flight instruments, flight testing and recording of flight tests.

UNIT-III (10H)
Radio Navigation Aids: Automatic direction finder distance measuring equipments, instrument landing system visual Omni range, radar, optical instruments, engine instruments and control, pressure measurements, thermal meter control, tachometer, accelerometer, smoke and fire detection, propeller controls, twin blade control, cabin pressure and temperature.

UNIT-IV (6H)
Satellite and space vehicle instrumentations: Satellite and space vehicle instrumentation, propulsion controls, sun sensors, horizon sensors, star tracker, stabilization controls.

UNIT-V (6H)

Electrical Troubles: Hydraulic systems trouble, landing gear troubles, cabin conditioning troubles, indication of unsafe canopy, Boeing condition, radio troubles, separate generator, system troubles, trouble indicator light, advantages of instrument flag, black box and its use.

REFEREANCE BOOK

1. John D Anderson JR, “Introduction to flight”, Mc Graw hill
2. Pallett E.G.H, “ Aircraft instrumentation and integrated systems”, Longman scientific and Technical,1992
3. Nagaraja N.S, “Elements of electronic navigation”, Mc Graw Hill , New Delhi 1975

Reliability Engineering
EIA-603(B)

ECA-603(B)	**Information Theory and Coding**	**3L:1T:0P**	**4 credits**	**3 Hrs/Week**

Course Preamble

1. To understand the concepts of different types of probability distributions importance of reliability evaluation of networks.
2. To make the students understand about Reliability, availability model of Power Systems and markov modeling of Power Plants. With identical and no identical units.

Course Outcomes

1. Able to understand the meaning of discrete and continuous random variables and their significance, causes of failures of a system.
2. Able to acquire the knowledge of different distribution functions and their applications.
3 .Able to develop reliability block diagrams and evaluation of reliability of different Systems

UNIT- I (10H)

Discrete and Continuous Random Variables: probability density function and cumulative distribution function, Mean and Variance, Binomial, Poisson, Exponential and Weibull distributions.

UNIT, II (10H)

Failure and Causes of Failure: Failure rate and failure density, Reliability function and MTTF, Bath tub curve for different systems, parametric methods for above distributions, Non-Parametric methods from field data.

UNIT- III (10H)

Reliability Block Diagram: Series and parallel systems, Network reduction technique, Examples, Evaluation of failure rate, MTTF and reliability, Active and Standby Redundancy, r out of n configuration. Non-series, parallel systems. Path based and cut set methods.

UNIT- IV (6H)

Availability, MTTR and MTBF: Markov models and State transition matrices, Reliability models for single component, two components, Load sharing and standby systems, Reliability and availability models of two unit parallel system with repair and standby systems with repair.

UNIT- V (6H)

Repairable Systems: Maintainability, Preventive maintenance, Evaluation of reliability and J1TTF, Overhauling and replacement, Optimum maintenance policy, Markov model of a power plant with identical units and non-identical unit, Capacity outage probability table.
Frequency of failures and Cumulative frequency

Reference Book

1) Charles E.Ebeling, "**Reliability and Maintainabelity Engineering**", Mc Graw Hill International Edition, 1997.
2) Balaguruswamy, "**Reliability Engineering,**"Tata McGraw Hill Publishing company Ltd,1984.
3) R.N.Allan. "**Reliability Evaluation of Engineering Systems**", Pitman Publishing, 1996.
4) Endrenyi. "Reliability Modelling in Electric Power Systems". JohnWiley & Sons, 1978.

Digital Image & Video Processing
EIA-604(A)

EIA-604(A)	**Digital Image & Video Processing**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preamble

1.To study the image fundamentals and mathematical transforms necessary for image processing.

2. To study the image enhancement techniques

3.To study image restoration procedures.

4. To study the image compression procedures.

Course Outcomes

1. Mathematically represent the various types of images and analyze them.
2. Process these images for the enhancement of certain properties or for optimized use of the resources.
3. Develop algorithms for image compression and coding

UNIT-I(10H)

Digital Image Fundamentals-Elements of visual perception, image sensing andacquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.

UNIT-II(10H)

Image Enhancements and Filtering-Gray level transformations, histogramequalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

UNIT-III(10H)

Color Image Processing-Color models–RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation. Image Segmentation- Detection of discontinuities, edge linking and boundarydetection, thresholding – global and adaptive, region-based segmentation.

UNIT-IV(6H)

Wavelets and Multi-resolution image processing- Uncertainty principles of FourierTransform, Time frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis,wavelets and Subband filter banks, wavelet packets.NImage Compression-Redundancy–inter-pixel and psycho-visual; Losslesscompression – predictive, entropy; Lossy compression-predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

UNIT-V(6H)

Fundamentals of Video Coding- Inter-frame redundancy, motion estimationtechniques – fullsearch, fast search strategies, forward and backward motion prediction, frame classification – I, P and B; Video sequence hierarchy – Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards – MPEG and H.26X.Video Segmentation- Temporal segmentation–shot boundary detection, hard-cutsand soft-cuts; spatial segmentation – motion-based; Video object detection and tracking.

Text/Reference Books:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008
2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004
3. Murat Tekalp , Digital Video Processing" Prentice Hall, 2nd edition 2015

Speech and Audio Processing
EIA-604(A)

EIA-604(A)	**Speech and Audio Processing**	**3L:0T:0P**	**3 credits**	**3 Hrs/Week**

Course Preamble:

To provide an introduction to basic concepts and methodologies for the analysis, modeling, synthesis and coding of speech and music. To provide a foundation for developing applications and for further study in the field. To introduce software tools for the analysis and manipulation of speech and music and to gain practical experience in the design and implementation of speech and music processing algorithms.

Course Outcomes:

1. Mathematically model the speech signal
2. Analyze the quality and properties of speech signal.
3. Modify and enhance the speech and audio signals.

UNIT-I(10H)
Introduction- Speech production and modeling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid ;Requirements of speech codecs –quality, coding delays, robustness.

UNIT-II(10H)
Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.

UNIT-III(10H)
Linear Prediction of Speech- Basic concepts of linear prediction; Linear Prediction Analysis of non stationary signals –prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction.

UNIT-IV(10H)
Speech Quantization- Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization – distortion measures, codebook design, codebook types.

UNIT-V(10H)
Scalar Quantization of LPC- Spectral distortion measures, Quantization based onreflection coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions,

quantization based on LSF. Linear Prediction Coding- LPC model of speech production; Structures of LP Cencoders and decoders; Voicing detection; Limitations of the LPC model.

Text/Reference Books:

1. “Digital Speech” by A.M.Kondoz, Second Edition (Wiley Students_ *Edition), 2004.*
2. “Speech Coding Algorithms: Foundation and Evolution of Standardized Coders”, W.C. Chu, WileyInter science, 2003

Introduction to MEMS
EIA-605 (A)

ECA-605 (A)	**Introduction to MEMS**	**3L:0T:0P**	**3 credits**	**3 Hrs/Week**

Course Preamble

The objective of this course is to present the state of the art in the areas of mechanical systems to enable the control systems.

Course Outcomes

At the end of the course the students will be able to
1. Appreciate the underlying working principles of MEMS and NEMS devices.
2. Design and model MEM devices

UNIT-I(10H)

Introduction and Historical Background, Scaling Effects. Micro-Nano Sensors.

UNIT-II(10H)

Actuators and Systems overview: Case studies. Review of Basic MEMS fabrication modules: Oxidation,
Deposition Techniques, Lithography (LIGA), and Etching.

UNIT-III(10H)

Micromachining: Surface Micromachining, sacrificial layer processes,

UNIT-IV(6H)

Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding. Mechanics of solids in MEMS/NEMS: Stresses, Strain, Hookes's law, Poisson effect, Linear Thermal Expansion, Bending; Energy methods,

UNIT-V(6H)
Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems.

Text/Reference Book:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalkrishnan K. N. Bhat, V. K. Aatre, Micro and Smart Systems, Wiley India, 2012.
2. S. E.Lyshevski, Nano-and Micro-Electromechanical systems: Fundamentals of Nano-and Microengineering (Vol. 8). CRC press, (2005).
3. S. D. Senturia, Microsystem Design, Kluwer Academic Publishers, 2001.
4. M. Madou, Fundamentals of Microfabrication, CRC Press, 1997.
5. G. Kovacs, Micromachined Transducers Sourcebook, McGraw-Hill, Boston, 1998.

Digital System Design using HDL
Verilog

EIA-605(B)

EIA-605 (B)	Digital System Design using HDL Verilog	**3L:0T:0P**	**3 credits**	**3 Hrs/Week**

Course Preamble

1. Describe Verilog hardware description languages (HDL).
2. Develop Verilog HDL code for combinational digital circuits.
3. Develop Verilog HDL code for sequential digital circuits.
4. Develop Verilog HDL code for digital circuits using switch level modeling and
5. describes system tasks, functions and compiler directives
6. Describes designing with FPGA and CPLD.

Course Outcomes

1. To understand syntax of various commands, data types and operators available with
2. verilog HDL
3. To design and simulate combinational circuits in verilog
4. To design and simulate sequential and concurrent techniques in verilog
5. To write Switch level models of digital circuits
6. To implement models on FPGAs and CPLDs

UNIT I (10H)

Introduction to Verilog HDL: Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools

Verilog Data Types and Operators: Binary data manipulation, Combinational and Sequential logic design, Structural Models of Combinational Logic, Logic Simulation, Design Verification and Test Methodology, Propagation Delay, Truth Table models using Verilog.

UNIT II (10H)

Combinational Logic Circuit Design using Verilog: Combinational circuits building blocks: Multiplexers, Decoders , Encoders , Code converters, Arithmetic comparison circuits, Verilog for combinational circuits , Adders-Half Adder, Full Adder, Ripple-Carry Adder, Carry Lookahead Adder, Subtraction, Multiplication.

UNIT III (10H)

Sequential Logic Circuit Design using Verilog: Flip-flops, registers & counters, synchronous sequential circuits: Basic design steps, Mealy State model, Design of FSM using CAD tools, Serial Adder Example, State Minimization, Design of Counter using sequential Circuit approach.

UNIT IV (10H)

Switch Level Modeling: Basic Transistor Switches, CMOS Switches, Bidirectional Gates, Time Delays with Switch Primitives, Instantiation with Strengths and Delays, Strength Contention with Trireg Nets.

System Tasks Functions and Compiler Directives: Parameters, Path Delays, Module Parameters. System Tasks and Functions, File Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

UNIT V

Designing with FPGAs and CPLDs: Simple PLDs,ComplexPLDs,Xilinx 3000 Series FPGAs, Designing with FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices (CPLDs), Altera FLEX 10K Series CPLDs.

Reference Book:

1) T.R. Padmanabhan, B Bala Tripura Sundari, "**Design Through Verilog HDL**", Wiley 2009.
2) Samir Palnitkar, "**Verilog HDL**", 2nd Edition, Pearson Education, 2009.
3) Stephen Brown, Zvonko Vranesic , "**Fundamentals of Digital Logic with Verilog Design**, TMH, 2nd Edition 2003.

Minor Project
EIA-606

EIA-606

EIA -606	**Project-I (Minor)**	**0L:0T:4P**	**2 credits**	**6Hrs/Week**

Course Outcomes:

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

1. Design and validate DC and AC bridges
2. Analyze the dynamic response and the calibration of few instruments
3. Learn about various measurement devices, their characteristics, their operation and their
4. limitations
5. understand statistical data analysis
6. Understand computerized data acquisition.

7. Conceive a problem statement either from rigorous literature survey or from the requirements
8. raised from need analysis.
9. Design, implement and test the prototype/algorithm in order to solve the conceived problem.
10. Write comprehensive report on Minor project work.

Guidelines:

1.The Minor-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2.The Minor project may be a complete hardware or a combination of hardware and software.
3.The software part in Minor project should be less than 50% of the total work.
3Minor Project should cater to a small system required in laboratory or real life.
4.It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
5.After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and Preambles of Minor project.
6.Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
7.The student is expected to exert on design, development and testing of the proposed work as per the schedule.
8. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design.

SEMESTER – VII

Opto-Electronic Instrumentation
EIA-701

EIA-701	**Opto-Electronic Instrumentation**	**3L:0T:P**	**3 credits**	**3Hrs/Week**

Course Preambles:

1.To expose to the students on the basics of optical sources and detectors, optical fiber and fiber optic sensors.
2.To impart knowledge on the characteristics of optical sources and detectors.
3.To introduce about the Industrial applications of fiber optic sensor and laser

Course Outcomes

1. Describe the properties, construction & classification of Lasers.
2. Explain operation & applications of Laser instruments with their safety measures.
3. Analyse operation & transmission in Optical fiber with their modulation techniques.
4. Express a fiber optic instrument to measure Electrical & Non Electrical parameters.
5. Analyse various optoelectronic sensors and display devices

UNIT-I (10H)

Laser fundamentals: Mechanisms Properties of Laser Generations, Optical Feedback, And Classification of LASER: Solid, Liquid, Gas, Lasers and their Respective Enginery Level Diagrams. Construction of Dye,Nd-YAG, Argon and carbon dioxide lasers, Characteristics of stabilization Q- switching and mode locking.

UNIT-II (10H)

Laser Instruments: Laser interferometers, laser strain gauges, pulse echo technique, Beam modulation
telemetry. Laser welding, Laser machining and Laser spectroscopy, Line shape function, lasing threshold,
Application of lasers in Engineering and Medicine, safety with lasers.

UNIT- III (10H)

Optical fibers Fundamentals: Introduction to optical fibers, Fundamentals of Transmission theory, Fiber
Fabrication and Manufacturing techniques, fiber Splicing, Connectors and Jointing Technique, Electro-
Optic, Mechano - Optic and Acousto-optic Modulation techniques, Losses in Optical fibers.

UNIT-IV (6H)

Fiber Optic Instrumentation: Classification and Principle of fibers optic sensors. Optical time Domain
Reflectometer. Multimode passive and active fibers sensors phase modulated sensors. Measurements of
currents, Voltage, pressure, Temperature, Displacement, Acceleration, and Fluid level using optical fibers.

UNIT- V (6H)
Optoelectronic Devices and Components: Photo diodes, LDRs, PIN diodes, Solar cells, LED, S phototransistors LCD, plasma Display, Opt isolators, Photo Couplers.

Reference Book:
1. Wilson & J.F.B. Hawkers, Optoelectronics- An Introduction Prentice Hall of India 2ndEdtions
2. Amar K. Ganguly, Optical & Opto Electronic Instrumentation, Narosa Publishing House.
3. Shukbir Kumar Sarkar, Optical Fibers and fiber Optics Instrumentation, 2nd edition.S. Chand &Company
4. R.P. Khara Fibre optics & Optical Commecam

EIA-701	Opto-Electronic Instrumentation	0L:0T:2P	1credits	2Hrs/Week

LIST OF EXPERIMENTS

1. Setting up Fiber Optic Analog Link and Digital Link
2. Study of Intensity Modulation Technique using Analog input signal
3. Pulse Width Modulation in Fiber Optic Link.
4. Measurement of propagation or attenuation loss in optical fiber.
5. Measurement of bending loss in optical fiber.
6. Numerical Aperture (NA) of the fiber.
7. Study of Diffraction gratings.
8. Study of Michelson Interferometer.
9. Study of Reflection Holography.
10. Study of Transmission Holography

Analytical Instrumentation
EIA-702

EIA-702	**Analytical Instrumentation**	**3L:0T:0P**	**3 Credit**	**3Hrs/Week**

Course Preambles:

1. To make the students equipped about the analysis of materials as it is an important requirement of process control and quality control in industry.
2. To expose the students to principles of various analytical methods.
3.To impart the knowledge on various instruments used in the analysis of materials.

Course Outcomes

1. Acquire knowledge of electromagnetic radiation with matter and apply analytical techniques.
2. Describe the relevance of material sampling and analysis in process control and quality control in industry.
3. Apply the knowledge of chromatography to separate the constituents from a complex mixture.
4. Identify the physical principles behind the various widely used analytical methods in the industry.
5. Select an appropriate analyser for an industrial requirement

UNIT-I (10H)

Review of basic components of analytical instrumentation, Calorimeter and Spectrophotometers, Electromagnetic radiation, Beer –Lamberts Law, Absorption instruments, Calorimeters, Spectrophotometers
sources of error and calibration.

UNIT-II (10H)

Infra –red Spectrophotometers infra-red Spectroscopy, Basic Components types of IR Spectrometry, sample
handling techniques, FT-IR Spectroscopy, Calibration, Mass Spectrometers, Basic mass Spectrometer, types,
Components, Resolution and application of Mass Spectroscopy.

UNIT-III (10H)

NMR, Principle of NMR Spectroscopy, Different types of NMR Spectrometers, Chromatography, Basic of
Gas Chromatography, Methods of measurement of peak areas, Liquid chromatography, types of amino acid

analysers.

UNIT-IV(6H)

Electro- Mechanical instruments, Electro-Chemical cell, Types of electrodes, potentiometers, conductivity
meters, polar – graphs, PH-meters, Principle of measurements, Electrodes, Selective lon electrode, chemically sensitive semiconductor devices, Bio- Sensors.

UNIT-V(6H)

Industrial gas Analysers, Types, Para–magnetic Oxygen analyser, Magnetic wind instruments, Infra-red gas
analyser, Thermal conductivity analyser, Analyser based on gas density, Methods based on ionization.
Environmental pollution monitoring instruments: Air pollution monitoring instruments, Co-S02 –No wet Chemical air analysis, Water pollution monitoring instruments.

Reference Book

1. H.M Willard, L.L. Merit, J. A. Dean, Instrumental Methods of Analysis CBS Publishers, Delhi.
3. R.S. Khandpur, Analytical instruments, Tata McGraw Hills1989.

EIA-702	**Analytical Instrumentation**	**0L:0T:2P**	**1 Credit**	**2 Hrs/Week**

LIST OF EXPERIMENTS

1. Study of Gas chromatograph
2. Study of X-Ray Spectrometer
3. Study of Ultraviolet & Visible Spectrophotometer
4. Study of Mass spectrometer
5. Viscosity measurement
6. Turbidity measurement

Program Elective-IV
EIA-703(A)
Non-Conventional
Energy Sources

EIA-703(A)	**Non-Conventional Energy Sources**	**3L:0T:0P**	**3 Credit**	**3Hrs/Week**

Course Preambles

1.To impart the knowledge of basics of different non-conventional types of power generation & power plants
in detail so that it helps them in understanding the need and role of Non-Conventional Energy sources particularly when the conventional sources are scarce in nature

Course Outcomes
1. Understand the different nonconventional sources and the power generation techniques to generate
electrical power.
2. Understand the Solar energy power development and different applications.
3. Understand different wind energy power generation techniques and applications.
4. Design a prescribed engineering sub-system
5. Recognize the need and ability to engage in lifelong learning for further developments in this field

UNIT-I (10H)

Review of Conventional and Non-Conventional energy sources - Need for non-conventional energy sources
Types of Non- conventional energy sources - Fuel Cells - Principle of operation with special reference to H2
°2 Cell - Classification and Block diagram of fuel cell systems - Ion exchange membrane cell – Molten carbonate cells - Solid oxide electrolyte cells - Regenerative system- Regenerative Fuel Cell - Advantages
and disadvantages of Fuel Cells-Polarization - Conversion efficiency and Applications of Fuel Cells.

UNIT-II (10H)

Solar energy - Solar radiation and its measurements - Solar Energy collectors -Solar Energy storage systems
- Solar Pond - Application of Solar Pond - Applications of solar energy.

UNIT-III (10H)

Wind energy- Principles of wind energy conversion systems - Nature of wind - Power in the Wind-Basic components of WECS -Classification of WECS -Site selection considerations -Advantages and disadvantages of WECS -Wind energy collectors -Wind electric generating and control systems - Applications of Wind energy -Environmental aspects.

UNIT- IV (6H)

Energy from the Oceans - Ocean Thermal Electric Conversion (OTEC) methods - Principles of tidal power generation -Advantages and limitations of tidal power generation -Ocean waves - Wave energy conversion devices -Advantages and disadvantages of wave energy - Geo-Thermal Energy - Types of Geo-Thermal Energy Systems - Applications of Geo-Thermal Energy.

UNIT-V (6H)

Energy from Biomass - Biomass conversion technologies / processes - Photosynthesis - Photosynthetic efficiency - Biogas generation - Selection of site for Biogas plant - Classification of Biogas plants - Details of commonly used Biogas plants in India - Advantages and disadvantages of Biogas generation - Thermal gasification of biomass -Biomass gasifiers.

Reference Book

1. Rai G.D, Non-Conventional Sources of Energy, Khandala Publishers, New Delhi, 1999.
2. M.M. El-Wakil, Power Plant Technology. McGraw Hill, 1984.

Mixed Signal Design
EIA-703(B)

EIA-703(B)	Mixed Signal Design	3L:0T:0P	3 Credit	3Hrs/Week

Course Preambles

1. Importance of CMOS and Mixed Signal VLSI design in the field of Electronics and Telecommunication.
2. Underlying methodologies for analysis and design of fundamental CMOS Analog and Mixed signal Circuits like Current and Voltage references, Single stage Amplifiers, Operational Amplifiers, Data Converters.
3. The issues associated with high performance Mixed Signal VLSI Circuits

Course Outcomes:

1. Understand the practical situations where mixed signal analysis is required.
2. Analyze and handle the inter-conversions between signals.
3. Design systems involving mixed signals

UNIT-I (10H)

Analog and discrete-time signal processing, introduction to sampling theory; Analog continuous time filters: passive and active filters; Basics of analog discrete-time filters and Z-transform.

UNIT-II(10H)

Switched-capacitor filters- Non idealities in switched-capacitor filters; Switched-capacitor filter architectures; Switched-capacitor filter applications.

UNIT-III(10H)

Basics of data converters; Successive approximation ADCs, Dual slope ADCs ,Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs.

UNIT-IV(6H)

Mixed-signal layout, Interconnects and data transmission; Voltage-mode signaling and data transmission; Current-mode signaling and data transmission.

UNIT-V(6H)

Introduction to frequency synthesizers and synchronization; Basics of PLL, Analog PLLs; Digital
PLLs; DLLs.

Text/Reference Books:

1. R. Jacob Baker, CMOS mixed-signal circuit design, Wiley India, IEEE press, reprint 2008.
2. Behzad Razavi , Design of analog CMOS integrated circuits, McGraw-Hill, 2003.
3. R. Jacob Baker, CMOS circuit design, layout and simulation, Revised second edition, IEEE press, 2008.
4. Rudy V. dePlassche, CMOS Integrated ADCs and DACs, Springer, Indian edition, 2005.
5. Arthur B. Williams, Electronic Filter Design Handbook, McGraw-Hill, 1981.
6. R. Schauman, Design of analog filters by, Prentice-Hall 1990 (or newer additions).
7. M. Burns et al., An introduction to mixed-signal IC test and measurement by, Oxford university press, first Indian edition, 2008

Open Core Elective - III
EIA-704(A)
Road Safety Engineering

EIA-704(A)	**Road Safety Engineering**	**3L:0T:0P**	**3 Credit**	**3Hrs/Week**

Course Preambles

1. Introduction to various factors considered for road safety and management
2. Explain the road safety appurtenances and design elements
3. Discuss the various traffic management techniques

Course Outcomes

1. Prepare accident investigation reports and database
2. Apply design principles for roadway geometrics improvement with various types of traffic safety appurtenances/tools
3.Manage traffic including incident management

UNIT – I (10H)

Road Accidents: Causes, scientific investigations and data collection, Analysis of individual accidents to arrive at real causes, statistical methods of analysis of accident data, Basic concepts of Road accident statistics, Safety performance function: The empirical Bayes method Identification of Hazards road location. Application of computer analysis of accident data.

UNIT – II (10H)

Safety in Road Design: Operating the road network for safety, highway operation and counter measures, road safety audit, principles-procedures and practice, code of good practice and checklists, vehicle design factors & Driver characteristics influencing road safety.

UNIT – III (10H)

Road Signs and Traffic Signals: Classification, Location of Signs, measures of sign effectiveness, Types of visual perception, sign regulations, sign visibility, sign variables, Text versus symbols. Road Marking:

Role of Road markings, Classification, visibility. Traffic Signals: Need, Signal face. Illumination and
location of Signals, Factors affecting signal design, pedestrians' safety, fixed and vehicle actuated signals.
Design of signa1s, Area Traffic control. Delineators, Traffic Impact Attenuators, Road side rest areas,
Safety Barriers, Traffic Aid Posts.

UNIT – IV (6H)

Traffic Management Techniques: Integrated safety improvement and Traffic Calming Schemes, Speed
and load limit, Traffic lights, Safety cameras, Tests on driver and vehicles, pedestrian safety issues, Parking,
Parking enforcement and its influence on Accidents. Travel Demand Management; Methods of Traffic
management measures: Restriction of Turning Movements, One-way streets, Tidal Flow Operation Methods, Exclusive Bus Lanes and Closing Side-streets; Latest tools and techniques used for Road safety and traffic management. Road safety issues and various measures for road safety; Legislation, Enforcement, Education and Propaganda, Air quality, Noise and Energy Impacts; Cost of Road Accidents.

UNIT – V (6H)

Incident Management: Introduction, Characteristics of Traffic Incidents, Types of Incidents, Impacts,
Incident management process, Incident traffic management; Applications of ITS: Motorist information,
Equipment used; Planning effective Incident management program, Best practice in Incident management
programs. National importance of survival of Transportation systems during and after all natural disasters especially cyclones, earthquakes, floods etc. and manmade disasters like sabotage, terrorism etc.

Reference Book

1. Guidelines on Design and Installation of Road Traffic Signals, IRC:93.
2. Specification for Road Traffic Signals, IS: 7537-1974.
3. Principles and Practice of Highway Engineering by L.R. Kadiyali and N.B. Lal.
4. Hand Book of T.E. Myer Kutz, Editor McGraw Hill, 2004.

EIA-704(B)
Principles of Electronic Communications

EIA-704(B)	Principles of Electronic Communications	3L:0T:0P	3 Credit	3Hrs/Week

Course Preambles

1. Provide an introduction to fundamental concepts in the understanding of communications systems.
2. Provide an introduction to network model and some of the network layers including physical layer,

data link layer, network layer and transport layer.

3. Provide an introduction to the evolution of wireless systems and current wireless technologies.

Course Outcomes

1. Understand the working of analog and digital communication systems
2. Understand the OSI network model and the working of data transmission
3. Understand the evolution of communication technologies from traditional telephony systems to modern wireless communication systems.

UNIT – I (10H)

Introduction to communication systems: Electromagnetic Frequency Spectrum, Signal and its representation, Elements of Electronic Communications System, Types of Communication Channels.
Signal Transmission Concepts: Baseband transmission and Broadband transmission,
Communication Parameters: Transmitted power, Channel bandwidth and Noise, Need for modulation **Signal Radiation and Propagation:** Principle of electromagnetic radiation, Types of Antennas, Antenna Parameters and Mechanisms of Propagation.

UNIT – II (10H)

Analog and Digital Communications: Amplitude modulation and demodulation, FM modulation and demodulation, Digital converters, Digital modulation schemes – ASK, FSK, PSK, QPSK, Digital demodulation.

UNIT – III (10H)

Data Communication and Networking: Network Models, OSI Model, Data Link Layer – Media Access
control, Ethernet, Network Layer – Internet Protocol (IPv4/IPv6), Transport Layer – TCP, UDP.

UNIT – IV (10H)

Telecommunication Systems: Telephones, Telephone system, Paging systems, Internet Telephony.
Optical Communications: Optical Principles, Optical Communication Systems, Fiber –Optic Cables,
Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT – V (10H)
Wireless Communications: Evolution of Wireless Systems: AMPS, GSM, CDMA, WCDMA, OFDM.
Current Wireless Technologies: Wireless LAN, Bluetooth, PAN and ZigBee, Infrared wireless, RFID communication, UWB, Wireless mesh networks, Vehicular adhoc networks.

Reference Book
1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill, 2008.
2. Data Communications and Networking, Behrouz A. Forouzan, 5e TMH, 2012

Project Stage-I
EIA-705

EIA -705	**Project-I**	**0L:0T:10P**	**5 credits**	**8Hrs/Week**

Course Outcomes:

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

1. Design and validate Electronics instrument algorithms for optimum solution
2. Analyze the dynamic response and the calibration of few instruments
3. Build projects as per industry and society demands.

Guidelines:

1. The Major-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2. The Major project may be a complete hardware or a combination of hardware and software.The software part in Minor project should be less than 50% of the total work.
3. Minor Project should cater to a small system required in laboratory or real life.
4. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
5. After interactions with course coordinator and based on comprehensive literature survey/need analysis, the student shall identify the title and define the aim and Preambles of Minor project.
6. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
8. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design

Self Study / GD/Seminar
EIA-706

EIA-706	**Self-Study/GD/Seminar**	**0L:0T:2P**	**1 credits**	**1Hrs/Week**

Course Preamble:

The main Preamble is to improve the mass communication and convincing/understanding skills of students .And to give the students an opportunity to exercise their rights to express themselves. The evaluation will be done based on their presentation work and group discussion.

Couse Outcomes:

In terms of **content**, students will be able to

Presentation Skills

They will be able to make use of visual, audio and audio-visual material to support their presentation, and will be able to speak cogently with or without notes. Students will present either in groups or as individuals.

Discussion Skills

Students will be able to judge when to speak and how much to say, speak clearly and audibly in a manner appropriate to the subject, ask appropriate questions, use evidence to support claims, respond to a range of questions, take part in meaningful discussion

Listening Skills

Students will demonstrate that they have paid close attention to what others say and can respond constructively. Through listening attentively, they will be able to build on discussion fruitfully, supporting and connecting with other discussants. They will be able to follow academic discussions, infer meanings that are not overt, and take notes from a discussion or presentation.

Argumentative Skills and Critical Thinking

Students will develop persuasive speech, present information in a compelling, well-structured, and logical sequence, respond respectfully to opposing ideas, show depth of knowledge of complex subjects, and develop their ability to synthesize, evaluate and reflect on information.

Questioning

Through asking appropriate questions, students will demonstrate their understanding of discussions and spark further discussion.

Interdisciplinary Inquiry

Students will be able to reach across diverse disciplines to apply theories, methods and knowledge bases from multiple fields to a single question or problem.

Engaging with Big Questions

Students will engage with important questions that stimulate discussion and debate.

Studying Major Works

Students will engage with works that are widely held to be significant in the field of study, while recognizingcultural diversity and the ever-changing nature of what is regarded as important

SEMESTER-VIII

Transducers and Sensors
EIA-801

EIA-801	**Transducers and Sensors**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preamble:

1. To make students familiar with the constructions and working principle of different types of sensors and transducers.
2.To make students aware about the measuring instruments and the methods of measurement and the use of different transducers.

Course Outcomes:

1. Use concepts in common methods for converting a physical parameter into an electrical quantity
2. Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light
3. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc
4. Predict correctly the expected performance of various sensors
5. Locate different type of sensors used in real life applications and paraphrase their importance

UNIT 1 (10H)

Functional elements of an instrument; active &passive transducers ;analog & digital modes of operation; null & deflection methods; I/O configuration of measuring instruments &instrument system-methods of correction for interfering &modifying inputs. Generalized performance characteristics of Instruments: Static characteristics and static calibration-Meaning of static calibration, measured value versus true value, Some basic statistics least square calibration curves, calibration accuracy versus installed accuracy.

UNIT 2 (10H)

Motion and Dimensional measurement: Fundamental standards ,relative displacement stranslational and rotational, Calibration, Resistive potentiometers, differential transformers, variable inductance &variable reluctance pickups, capacitance pickup, Digital displacement transducers, Mechanical fly ball angular velocity sensor, Mechanical revolution counters .

UNIT 3 (10H)

Force, Torque, Shaft power: Standards & calibration; basic methods of force measurement; characteristics of elastic force transducer -Bonded strain gauge, differential transformer, Piezoelectric transducer, variable reluctance/FM-oscillator, digital systems.

UNIT 4 (6H)

Flow measurement: Local flow velocity, magnitude and direction. Flow Visualization. Velocity magnitude from pilot static tube. Velocity direction from yaw tube, dynamic wind vector indicator. Hot-film shock-tube velocity sensor. Laser Doppler anemo-meter; gross volume flow rate: calibration and standards .Constant-area, variable-pressure-drop meters (obstruction meters).Averaging pilot tubes..

UNIT 5 (6H)

Temperature measurement: Standards & calibration; thermal expansion methods-bimetallic thermometers, liquid-in-glass thermometers, pressure thermometers; RTD, thermistor and thermocouple (comparative study); digital thermometers. Radiation Methods - radiation fundamentals, radiation detectors: thermal and photon, monochromatic brightness radiation thermometers, two color radiation thermometers, black body tipped fiber optic radiation thermometer, Fluor optic temperature measurement, infrared imaging systems.

Text Book:

1. E. O. Doebelin and D.N. Manik,"Measurement systems application and design‖, Tata McGraw Hill Publication.
2. Reference Book: 1. Arun K Ghosh, "Introduction to Transducers", PHI Publication. 2. Bela G. Liptak, "Process Measurement and Sensors

EIA-801	**Advance Programmable Logic Controller**	**0L:0T:2P**	**1 credits**	**2 Hrs/Week**

List of Experiments:

1. Characteristics of resistance transducer (i) Potentiometer (ii) Strain Gauge
2. Characteristics of LVDT.
3. Characteristics of capacitive transducer (i) Variable area (ii) Variable distance.
4. Characteristics of Thermistors
5. Characteristics of RTD.
6. Characteristics of Thermocouples

7. Characteristics of LDR, Photo Diode, and Phototransistor: (i) Variable Illumination. (ii) Linear Displacement.
8. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.
9. Measurement of Capacitance by De'Sautys and Schering Bridge.
10. Measure of low resistance by Kelvin's double bridge.

Program Elective-V
EIA-802 (A)
Digital Control Systems

EIA-802(A)	Digital Control Systems	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:

1. To impart knowledge in the significance and features of design of discrete- time control system.
2. To review on the different transform techniques for digital control system design.
3. To impart knowledge on the techniques to analyse the system performance in the discrete-time domain.
4. To impart knowledge in discrete state space controller design.

Course Outcomes

1. Understand the various issues related to digital control systems such as effects of sampling and quantization, discrete time signals and models.
2. Represent a discrete-time control system using state space technique.
3. Design discrete control systems via pole placement.
4. Design observers for discrete control systems.
5. Analyse the stability of a discrete-time control system.

UNIT-I (10H)

Introduction to digital control Configuration of basic digital control system: discrete transfer function, discrete model sampled data systems using z- transform, transfer function model, signal analysis and dynamic response, zero-order hold equivalent, introduction to first-order-hold equivalent, transformation
between splane, z-plane and w-plane, z-Domain description of sampled continuous-time systems. Controller
design Controller Design using transform techniques: Root locus and frequency domain analysis compensator design.

UNIT-II (10H)

State space theory Control system analysis using state variable method: vector and matrices, state
variable representation, conversion of state variable to transfer function and vice versa, conversion of
transfer function to canonical state variable models, system realization, solution of state equations. Solution
of discrete-time state equation. Computational methods.

UNIT-III (10H)

State space design using state-space methods: controllability and observability, control law design, pole
placement, pole placement design using computer aided control system design (CACSD).

UNIT-IV (6H)

Observer design: Full order and reduced order discrete observer design - Kalman filter and extended
Kalman filter design.

UNIT-V (6H)

Stability improvement by state feedback: Stability analysis and Jury's stability criterion, Lyapunov
stability analysis to linear systems and discrete systems, Stability Improvement by state feedback.

Reference book

1. K. Ogata, Discrete Time Control Systems, Prentice Hall India, 2nd edition, 2005.
2. M. Gopal, Digital Control and state variable methods, Tata McGraw Hill, 3rd edition., 2008.

Embedded systems
EIA-802 (B)

EIA-802(B)	**Embedded systems**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preamble:

1.Students have knowledge about the basic functions of embedded systems

Course Outcomes:

1. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

Unit I :(10H)

Introduction to Embedded System, Categories, Requirements, Applications, Challenges and Issues. Core of Embedded system, Memory, Sensors and Actuators, communication interface, Embedded firmware, system components.

Unit II: (10H)

Fundamental issues of hardware software co-design, computational models in embedded design data flow graph, control flow graph, state machine model, sequential programmed model, concurrent model, unified modeling language.

Unit III: (10H)

Architecture of 8085 microcontroller, memory organization, registers, interrupts, addressing modes, instruction sets.

Unit IV: (10H)

Embedded firmware design approaches- OS based, Super loop based. Embedded firmware development languages- Assembly language based, high level language based, mixed. Programming in embedded C.

Unit V: (10H)

Types of Operating system, Task, process and threads, Multi processing and multi task, Task scheduling, Task communication, Task synchronization.

References:-

1. Shibu K V, “Introduction to Embedded System”, TMH.
2. David E Simon, “An Embedded Software Primer”, Pearson education Asia, 2001.
3. Steven F. Barett, Daniel J. Pack, “Embedded Systems” Pearson education, First Impression 2008.
4. Vahid Frank, Tony Givargis, “Embedded System Design”, John Wiley and Sons, Inc.
5. Dream Tech Software Team, “Programming for Embedded Systems” Wiley Publishing house Inc.

   Sriram V Iyer, Pankaj Gupta, “Embedded Realtime Systems Programming”, TMH

Open Core Elective - IV
EIA-803(A)
CAD of Digital Systems

EIA-803(A)	CAD of Digital Systems	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:

1.Understand the fundamentals used to create and manipulate geometric models
2.Get acquainted with the basic CAD software designed for geometric modeling
3.Learn working principles of NC machines CNC control and part programming
4.Understand concept of Group Technology, FMS and CIM

Course Outcomes

1. Describe basic structure of CAD workstation, Memory types, input/output devices and display devices and computer graphics.
2. Acquire the knowledge of geometric modeling and Execute the steps required in CAD software for developing 2D and 3D models and perform transformations
3. Explain fundamental and advanced features of CNC machines
4. Illustrate Group Technology, CAQC and CIM concepts

Unit 1(10H)

Introduction: Information requirements of mfg organizations; business forecasting and aggregate production plan; MPS, MRP and shop floor/ Production Activity Control (PAC); Mfg as a system, productivity and wealth creation; production processes on volume-variety axes; importance of batch and job shop production; CIM definition and CIM wheel, evolution and benefits; CIM as a subset of Product Life Cycle (PLC) mgt; design for mfg (DFM) and concurrent engg; product design in conventional and CIM environment; terms like CAD, CAE, CAM, CAP, CAPP, CATD and CAQ.

Unit 2(10H)

Graphics and standards: Raster scan, coordinate systems for model (M/ WCS) user and display; database for graphic modeling; PDM, PIM, EDM; define EDM, features of EDM; basic transformations of geometry- translation, scaling, rotation and mirror; introduction to modeling software; need for CAD data standardization; developments in drawing data exchange formats;

GKS, PHIGS, CORE, IGES, DXF STEP DMIS AND VDI; ISO standard for exchange of Product Model data-STEP and major area application protocols.

Unit 3(10H)

Geometric Modeling: Its use in analysis and mfg; 2D and 3D line, surface and volume models; linear extrusion and rotational sweep; Constructive Solid Geometry (CSG); basics of boundary presentation- spline, Bezier, b-spline, and NURBS; sculpture surfaces, classification, basics of coons, Bezier, b-spline and ruled surfaces; tweaking, constraint based parametric modeling; wire frame modeling, definition of point, line and circle; polynomial curve fitting; introduction to rapid prototyping.

Unit 4(6H))

Numeric control and part programming: Principles of NC machines, CNC, DNC; NC modes of point to point, -line and 2D, 3D contouring; NC part programming; ISO standard for coding, preparatory functions(G)- motion, dwell, unit, preset, cutter compensation, coordinate and plane selection groups; miscellaneous (M) codes; CLDATA and tool path simulation; ISO codes for turning tools and holders; ATC, modular work holding and pallets; time and power estimation in milling, drilling and turning; adaptive control, sequence control and PLC; simple part programming examples.

Unit 5(6H)

Group Technology: Importance of batch and job shop production; merits of converting zigzag process layout flow to smooth flow in cellular layout, Production Flow Analysis (PFA) and clustering methods; concept of part families and coding; hierarchical, attribute and hybrid coding; OPITZ, MICLASS and DCLASS coding; FMS; material handling; robots, AGV and their programming; agile mfg; Computer Aided Process Planning (CAPP), variant/ retrieval and generative approach

References:

1. S.Kant Vajpay; Principles of CIM; PHI

2. Rao PN; CAD/CAM;TMH

3. Groover MP; Automation, Production Systems & CIM; P.H.I.

4. Rao PN, Tiwari NK, Kundra TK; Computer Aided Manufacturing; TMH

5. Alavudeen A, Venkteshwarn N; Computer Integrated Mfg; PHI

6. Radhakrishnan P, Subramanian S and Raju V; CAD/CAM/CIM;

Engineering and Acoustics

EIA-803 (B)

EIA-803(B)	Engineering and Acoustics	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:
The fundamentals of sound wave description and propagation, noise control techniques, the hearing mechanism, acoustic instrumentation, noise criteria, psychoacoustics, sound source types and radiated sound fields, outdoor sound propagation, sound power measurement techniques, sound transmission loss, acoustic enclosures.

Course Outcomes
1. Be able to assess complex occupational and environmental noise problems using acceptable assessment criteria.
2. Understand the importance of protecting the community from excessive noise and how it damages the hearing mechanism.
3. Be able to use instrumentation for noise measurement and understand the type of measurements appropriate for various situations.

Unit-I (10H)

Audio and acoustics sub disciplines, survey Fundamental quantities, Fourier review, mass and vibration Damping, complex exponential solutions, forced oscillation.

Unit-II(10H)

Resonance, electrical circuit analogies Acoustic wave equation.

Unit-III (10H)

Armonic plane waves, intensity, impedance Spherical waves, sound level, dB examples Radiation from small sources.

Unit-IV (6H)

Baffled simple source, piston radiation Near field, far field Radiation impedance.

Unit-V (6H)

Recap and review Demos, speed of sound measurement.

Reference

1. Foundations of engineering acoustics Book by Frank Fahy

2. Engineering Acoustics: An Introduction to Noise Control Book by Michael Moser

Project Stage-II
EIA-804

EIA- 804	**Projects –II (Major)**	**0L:0T:16P**	**8 credits**	**12Hrs/Week**

Preambles:

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone orjointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under EEP1;

2. Review and finalization of the Approach to the Problem relating to the assigned topic;

3. Preparing an Action Plan for conducting the investigation, including team work;

4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;

5. Final development of product/process, testing, results, conclusions and future directions;

6. Preparing a paper for Conference presentation/Publication in Journals, if possible;

7. Preparing a Dissertation in the standard format for being evaluated by the Department.

8. Final Seminar Presentation before a Departmental Committee

Induction Program

MC	**Induction Program**	**0L:0T:0P**	**Nil**	**2Hrs/Week**

Induction program (mandatory)	**3 weeks duration** (Please refer Appendix-A for guidelines & also details available in the curriculum of Mandatory courses)
Induction program for students to be offered right at the start of the first year.	• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

A student has to undergo this induction program after joining the institute and before the commencement of classes. Normal classes of the engineering program shall begin after the students have undergone a three-weeks induction program. The Induction program for students comprises of Physical activities; Learning an art form; Literature & Cinema; Social Awareness; Lectures &Visits; Universal Human Values; Familiarization to Department/ Branch, College& Innovations

Constitution of India

MC	**Constitution of India**	**0L:0T:0P**	**Nil**	**2Hrs/Week**

Unit 1. Introduction

Concept of liberty; Concept of positive and negative obligations

Unit 2 The Premises of Social Revolution:

Intellectual and historical origins of the concept of Social Economic Justice in India.

Unit 3 Sixty years of civil rights movement in India:

Moderate nationalism and the emergence of the politics of socio-economic justice; Annie Besant, the Theosophical Society and the Home Rule League Movement,

Unit 4 Impact of Socialism on the Writing of the Indian Constitution [I], [1914-31]:

From the First World War to the Karachi Resolution: [a] Jawaharlal Nehru's arrival in national politics and his initiation in municipal politics; [b] The Bolshevik Revolution [1917] and its impact on growth of Indian socialism; [c] Growth and influence of Fabian socialists on Indian nationalism; [d] Commonwealth of India Bill [1925]; [e] National Demand or the Motilal Nehru Report [1927-8] and the Calcutta Congress [1928]; [f] Karachi Resolution of the Indian National Congress [1931]

Unit 5 Impact of Socialism on the Writing of the Indian Constitution [II], [1932-52]:

From the Demand for Adult Suffrage to Passing of the Constitution of India: [a] Growth of the Congress Socialist Party and the demand for the adoption of adult suffrage; [b] Panchayati Raj and empowerment in the Indian Constitution; [c] The National Plan [1938], the Bombay Plan [1944] and proposals for large-scale industrialisation in India; [d] The August Offer [1940], Cripps Mission [1942] and the Cabinet Mission proposals [1946]; [e] The establishment of Indian Constituent Assembly [1946], the Indian Independence Act [1947], the working of the Constituent Assembly and the Assembly debates and the role of the Oligarchy comprising of Jawahaharlal Nehru, Vallabhbhai Patel, Maulana Abul Kalam Azad and Rajendra Prasad in it; [f]

Social reforms and State Security v. 'Due Process of Law'; [g] The introduction, passage and development of the Hindu Code Bill, 1956

References:

1. Bagehot, Walter, An Introduction to English Legal History, [London, 1990]
2. Berlin, Isaiah, Henry Hardy and Ian Harris, Liberty: Incorporating Four Essays on Liberty, [Oxford, 2002]
3. Austin, Granville, The Indian Constitution: Cornerstone of a Nation, [Oxford, 1966] –, Working of a Democratic Constitution: A History of the Indian Experience, [New Delhi, 2003]
4. Bagchi, Amiya Kumar, Private Investment in India, 1900-1939, [London, 1972]
5. Bakshi, P.M., The Constitution of India: With Comments and Subject Index, [Delhi, 1991]
6. Basu, Durgadas, Introduction to the Constitution of India, [New Delhi, 1995] –, Shorter Constitution of India, [Calcutta, 1959]
7. Chandra, Bipan, [et al.], India's Struggle for Independence, [New Delhi, 1991]
8. Coupland, Reginald, The Indian Problem, Three Volumes, [London, 1944]
9. Dutta, Nilanjan, 'From Subject to Citizen: Towards a History of Indian Civil Rights Movement', in Michael Anderson and Sumit Guha, Changing Concepts of Rights and Justice in South Asia, [New Delhi, 2000]
10. Dhavan, Rajeev and Thomas Paul, Nehru and the Constitution, [Bombay, 1992]
11. Forbes, Geraldine, Women in India, [Cambridge, 1996] Gauba, O.P., Constitutionalism in a Changing Perspective, [New Delhi, 1996]
12. Mohanty, Manoranjan, 'Does India Need a New Constitution? [A Democratic Right Perspective on Constitutional Discourse]', in Surya Narayan Misra, Subhas Chandra Hazary and Amareshwar Misra, [ed.], Constitution and Constitutionalism in India, [New Delhi, 1999]

(09) Assessment

PO/ Course Assesment Tools Types	PO/Course Assesment Tools	PO 1	PO 2	PO3	PO4	PO 5	PO 6	PO7	PO 8	PO 9	PO10	PO11	PO 12
		Engineering Knowledge	Problem Analysis	Design/ Development of Solution	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team Work	Communication	Project Management	Life-Long Learning
Direct Tools	Test	□	□	□	□				□		□	□	
	Assignments	□	□			□				□			
	lab /seminar/ industrial training/projects(Rubrics)	□	□	□		□		□	□	□	□	□	□
Indirect Tools	Course end survey	□				□		□					
	Exit survey	□	□										□
	Faculty Survey		□	□	□			□					
	Alumni Survey	□			□		□		□	□	□		□
	Program Statistics	□			□				□			□	