

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 Communication Engineering

(1) Vision: “To be recognized by the society at large as a full- fledged department, offering quality higher education in the **Electronics and Communication Engineering** field with research focus catering to the needs of the public and staying in tune with the advancing technological revolution and challenging cultural changes.”

(2) Mission

1. Establish a unique learning environment to enable the students to face the challenges of the Electronics and Communication Engineering field.
2. Promote the establishment of centres of excellence in niche technology areas to nurture the spirit of innovation and creativity among faculty and students.
3. Provide ethical and value based education by promoting activities addressing the societal needs.
4. Enable students to develop skills to solve complex technological problems of current times and also provide a framework for promoting collaborative and multidisciplinary activities.

(3) Program Educational Preambles (PEO's)

PEO 1: Practice the ethics of their profession consistent with a sense of social responsibility and develop their engineering design, problem –solving skills and aptitude for innovations as they work individually and in multi-disciplinary teams.

PEO 2: Communicate effectively and manage resources skillfully as members and leaders of the profession.

PEO 3: Be receptive to new technologies and attain professional competence through lifelong learning such as advanced degrees, professional registration, publications and other professional activities.

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(4) Program Outcomes (POs)

PO-01: Engineering knowledge: Utilize the basic knowledge in mathematics, science and engineering in Electronics and Communication Engineering field.

PO-02: Design/development of solutions : Identify, formulate and solve complex problems to achieve demonstrated conclusions using mathematical principles and engineering sciences.

PO-03: Problem analysis: Design system components that meet the requirement of public safety and offer solutions to the societal and environmental concerns.

PO-04: Conduct investigations of complex problems: Apply research based knowledge to design and conduct experiments, analyze, synthesize and interpret the data pertaining to Electronics and Communication Engineering problems and arrive at valid conclusions.

PO-05: Modern Tool Usage : Construct, choose and apply the techniques, resources and modern engineering tools required for Electronics and Communication Engineering applications.

PO-06: The engineer and society: Apply the contextual knowledge to assess societal, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

PO-07: Environment and sustainability: Examine the impact of engineering solutions in global and environmental contexts and utilize the knowledge for sustained development.

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PO-08: Ethics: Develop consciousness of professional, ethical and social responsibilities as experts in the field of Electronics and Communication Engineering.

PO-09: Individual and team work: Perform effectively as a member/leader in multidisciplinary teams.

PO-10: Communication: Communicate the engineering activities to engineering society for documentation and presentation.

PO-11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles to manage projects in multidisciplinary environment.

PO-12: Life-long learning: Demonstrate resourcefulness for contemporary issues and lifelong learning.

(5)Program Specific Outcomes (PSOs)

PSO-1: Apply the fundamental concepts of electronics and communication engineering to design a variety of components and systems for applications including signal processing, image processing, communication, networking, embedded systems, VLSI and control system

PSO-2: Select and apply cutting-edge engineering hardware and software tools to solve complex Electronics and Communication Engineering problems

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

			PO 1	PO2	PO3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO10	PO11	PO1 2		
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(EC)	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		Name of the Courses/POs(Basic, Core Electives, Projects, Internships etc.)	PO 1	PO2	PO3	PO4	PO5	PO 6	PO7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
1	Semester		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	Lifelong Learning		
2	Semester-Ist	Mathematics-I	*	*	*	*								*		
		Engineering Physics	*	*		*								*		
		Basic Computer Engineering	*	*	*	*	*			*		*		*		
		Basic Mechanical Engineering	*	*	*	*	*									
		Basic Civil Engineering & Mechanics	*	*	*				*						*	
		Language Lab					*			*	*	*		*		
		Self Study / GD Seminar	*	*	*	*	*			*	*		*	*		
3	Semester-IIInd	Mathematics-II	*	*	*	*								*		
		Engineering Chemistry	*	*	*	*										
		English for Communication	*									*			*	
		Basic Electrical & Electronics Engineering	*	*	*	*										
		Engineering Graphics	*	*	*	*										*
		Manufacturing Practices					*			*	*	*	*	*		
		Industrial Training			*	*		*	*	*	*		*	*	*	
4	Semester-IIIrd	Mathematics -III	*	*	*	*										
		Electromagnetic Theory		*	*											
		Measurement Science & Techniques	*	*	*											
		Electronic Devices	*	*	*											
		Network Analysis and Synthesis	*	*	*	*								*		
		Simulation Lab-I	*	*	*	*	*									
		Self Study /GD Seminar		*	*		*	*	*	*		*	*	*		
	Semester-IVth	Energy,Ecology ,Environment and Society						*	*		*				*	

		Digital Electronics	*	*										*	
		Signals and System	*	*	*										
		Analog Communication	*	*	*	*									
		Electronics Instrumentation	*	*	*										
		Simulation Lab-II			*	*	*						*		
		Industrial Training-I		*	*		*	*	*	*		*	*		
5	Semester-Vth	Computer Architecture		*	*	*	*								
		Digital Signal Processing		*	*	*		*							
		CMOS Design		*	*										
		Power Electronics					*								
		Nano Electronics	*												
		Neural Network	*												
		Scientific computing	*	*		*				*			*		
		Data Compression & Cryptography	*	*											
		Operating System	*	*	*	*							*		
		Industrial Training-I	*	*	*	*									
6	Semester VIth	Control Systems	*	*	*	*									
		Optical Communication	*	*	*	*									
		(A) Computer Networks	*	*	*	*									
		(B) Information Theory and Coding	*	*	*	*		*	*	*					
		(A) Digital Image & Video Processing	*	*	*	*									
		(B) Speech and Audio Processing	*				*	*	*	*			*		
		(A) Introduction to MEMS	*	*	*	*	*			*					
		(B) Bio-Medical Electronics	*	*											
		Minor Project	*	*	*	*	*								
7	Semester VIIth	Microwave Theory and Techniques	*	*	*	*	*	*	*						
		Antennas and Propagation	*	*	*	*									

8	Semester VIIIth	Satellite Communication	*	*	*	*	*									
		Mixed Signal Design	*	*	*	*			*		*		*	*		
		Wireless Sensor Networks	*	*	*	*										
		High Speed Electronics	*	*	*	*			*							
		Project Stage-I			*	*										
		Self Study/GD/Seminar		*	*	*		*	*							
	Semester VIIIth	T.V & Radar Engineering	*	*										*	*	
		Mobile Communication and Networks	*											*	*	
		Embedded systems	*				*			*		*	*			
		CAD of Digital Systems	*	*			*									
		Engineering and Acoustics		*	*				*							
		Project Stage-II	*	*		*								*		

(08) Structure of Program: To fulfill the need of development of all the POs/ GAs, as per above mapping, the following semester wise program structure are as under.

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

Total Credits*= 160

Structure of Undergraduate Engineering program:

S. No.	Course Category	Credits of the EC Curriculum
1.	Humanities and Social Sciences including Management	08
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 Examination (Electronics and Communication 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

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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	Assignments/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	BEHSM C-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

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III SEMESTER

S.N O.	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/Qui z	End Sem. Practical & Viva	Practical Record /Assignmen t/ Quiz / Presentatio n		L	T	P	
1	BEA -301	Mathematics - III	60	3 0	10			100	3		-	3
2	ECA -302	Electromagne tic Theory	60	3 0	10			100	2	1	-	3
3	ECA -303	Measurement Science & Techniques	60	3 0	10	30	20	150	3		2	4
4	ECA -304	Electronic Devices	60	3 0	10	30	20	150	3		2	4
5	ECA -305	Network Analysis and Synthesis	60	3 0	10	30	20	150	2	1	2	4
6	ECA -306	Simulation Lab-I				30	20	50			2	1
7	ECA -307	Self Study /GD Seminar					50	50			2	1
		TOTAL	300	150	50	120	130	750	13	2	10	20

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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	Assignments/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	ECA-402	Digital Electronics	60	30	10	30	20	150	2	1	2	4
3	ECA-403	Signals and System	60	30	10	30	20	150	3		2	4
4	ECA-404	Analog Communication	60	30	10	30	20	150	3		2	4
5	ECA-405	Electronics Instrumentation	60	30	10	30	20	150	2	1	2	4
6	ECA-406	Simulation Lab-II				30	20	50			2	1
7	ECA-407	Industrial Training-I	To be completed anytime during Third/Fourth semester. Credit to be added in fifth semester									
		TOTAL	300	150	50	150	100	750	13	2	10	20

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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	Assignments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	ECA-501	Computer Architecture	60	30	10	30	20	150	2	1	2	4
2	ECA-502	Digital Signal Processing	60	30	10	30	20	150	2	1	2	4
3	ECA-503	CMOS Design	60	30	10	30	20	150	2	1	2	4
4	ECA-504	Program Elective-I	60	30	10	-		100	3	1	0	4
5	ECA-505	Open Core Elective - I	60	30	10	-		100	3	1	0	4
6	ECA-506	Industrial Training-I				150	100	250			4	2
	TOTAL		300	150	50	240	160	900	12	5	10	22

Program Elective-I	ECA-504(A) Power Electronics	ECA-504(B) Nano Electronics	ECA-504(C) Neural Network
Open Core Elective - I	ECA-505(A) Scientific computing	ECA-505(B) Data Compression & Cryptography	ECA-505(C) Operating System

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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	Assignments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	ECA-601	Control Systems	60	30	10	30	20	150	2	1	2	4
2	ECA-602	Optical Communication	60	30	10	30	20	150	2	1	2	4
3	ECA-603	Program Elective-II	60	30	10			100	3	1	0	4
4	ECA-604	Program Elective-III	60	30	10	-		100	3	0	0	3
5	ECA-605	Open Core Elective - II	60	30	10	-		100	3	0	0	3
6	ECA-606	Minor Project	-	-	-	180	120	300	-	-	4	2
	TOTAL		300	150	50	240	160	900	13	3	8	20

Program Elective-II		
ECA-603	(A) Computer Networks	(B) Information Theory and Coding
Program Elective-III		
ECA-604	(A) Digital Image & Video Processing	(B) Speech and Audio Processing
Open Core Elective - II		
ECA-605	(A) Introduction to MEMS	(B) Bio-Medical Electronics

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SEMESTER-VII

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

Program Elective-IV		
ECA-703	(A) Satellite Communication	(B) Mixed Signal Design
Open Core Elective - III		
ECA-704	(A) Wireless Sensor Networks	(C) High Speed Electronics

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SEMESTER-VIII

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	Assignments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	EC A-801	T.V & Radar Engineering	60	30	10	30	20	150	3	0	2	4
3	EC A-802	Program Elective-V	60	30	10			100	3	0	0	3
4	EC A-803	Open Core Elective - IV	60	30	10	-		100	3	0	0	3
6	EC A-804	Project Stage-II	-	-	-	240	160	400	-	-	16	8
	TOTAL		180	90	30	270	180	750	9	0	18	18

Program Elective-V		
ECA-802	(A) Mobile Communication and Networks	(B) Embedded systems
Open Core Elective - IV		
ECA-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
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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.

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 (10 Hrs):

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, 11th Reprint, 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
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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.

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 characterization 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

REFERENCES:

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
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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:

The students will learn to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
- 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
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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 (CO):

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-V Business 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, Macmillan 2007.

BEHSMC-103	English for Communication	0L:0T:1P	1 credits	2Hrs/Week
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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
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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. S. Bobrow, "Fundamentals of Electrical En
- 7 .V. D. Toro, "Electrical Engineering Fundamen

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

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

BEBSC-201 Mathematics-II

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

1. To introduce the basic concepts required to understand, construct, solve and interpret differential equations.
2. To teach methods to solve differential equations of various types.
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
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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 Electromagnetism 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 approach
- To classify magnetic and superconducting 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 accelerator, Cyclotron, Betatron, Bainbridge mass spectrometer.

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. Fraunhofer 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 - Arthur Beiser (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
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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
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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
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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 whether 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
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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
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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
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Course 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. Ramamrutham & 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
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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 bea

BEHSMC-206 Language Lab and Seminar

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

ECA-302

ECA-302	Electromagnetic Fields	2L:1T:0P	3 credits	3Hrs/Week
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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 of electromagnetic 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, Coulomb'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 vector..

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

Measurement Science & Techniques

ECA-303

ECA-303	Measurement Science & Techniques	3L:0T:0P	3 credits	3Hrs/Week
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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 List of

ECA-303	Measurement Science & Techniques	0L:0T:2P	1 credits	2Hrs/Week
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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 of study (Accuracy, precision, sensitivity, Resolution).
2. Experiments of Galvanometer.
3. Study of Bridge (Kalvin’’s, Maxwell, Anderson, Hay’’s, Wein).

Electronic Devices

ECA-304

ECA-304	Electronic Devices	03L:0T:0P	3 credits	3 Hrs/Week
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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 periodic Lattices, 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-V characteristics, 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.

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

ECA-305

ECA-305	Network Analysis and Synthesis	2L:1T:0P	3 credits	2 Hrs/Week
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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 topology, nodes, 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 interrelationship, 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 Tellegen's theorem as applied to AC circuits.

Unit-II(10H)

Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

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 poles and 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
4. A William Hayt, “Engineering Circuit Analysis” 8th Edition, McGraw-Hill Education

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

ECA-306

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

ECA-307

GD / SS

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

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. Cunningham WP and MA; principles of Environment Sc; TMH
11. Gandhiji M.K.- My experiments with truth

Digital Electronics

ECA-402

ECA-402	Digital Electronics	2L:1T:0P	3 Credits	3Hrs/Week
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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 and Full 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.

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

ECA-403

ECA-403	Signals and System	3L:0T:0P	3 Credits	3Hrs/Week
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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 discrete amplitude 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, input/output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

Unit-III(10H)

Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation 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 the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal Bases.

Unit-IV(6H)

The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system 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 and its 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 its effects. 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.

ECA-403	Signals and System	0L:0T:2P	1 Credits	2 Hrs/Week
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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
ECA-404**

ECA-404	Analog Communication	3L:0T:0P	3 Credits	3Hrs/Week
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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 of Amplitude 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 in amplitude 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.

ECA-404	Analog Communication	0L:0T:2P	1 Credits	2 Hrs/Week
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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 Instrumentation

ECA-405

ECA-405	Electronic Instrumentation	2L:1T:0P	3 Credits	3Hrs/Week
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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.
3. To develop concepts of stability and its assessment criteria.

Course Outcomes

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, Hysteresis, Loading Effect. Measurements of Current, Voltage, Power and Impedance: DC and AC Ammeter, DC Voltmeter Chopper 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 CROs Multi 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.

ECA-405	Electronic Instrumentation	0L:0T:2P	1 Credits	3Hrs/Week
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List of Experiments: 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 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

ECA-406

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

ECA- 407- Industrial Training – I

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

ECA-501

Computer Architecture

ECA-501	Computer Architecture	2L:1T:0P	3 credits	2Hrs/Week
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Course Preambles:

To understand the structure, function and characteristics of computer systems. To understand the design of the various functional units and components of computers. To identify the elements of modern instructions sets and their impact on processor design.

Course Outcomes:

1. learn how computers work
2. know basic principles of computer's working
3. analyze the performance of computers
4. know how computers are designed and built
5. Understand issues affecting modern processors (caches, pipelines etc.).

UNIT-I(10H)

Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.

UNIT-II (6H)

Processor organization, Information representation, number formats.

UNIT-III(10H)

Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods, and CPU control unit.

UNIT-IV (10H)

Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit.

Microprogrammed computers - CPU control unit Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache & associative memories, Virtual memory.

UNIT-V(6H)

System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network.

Text/Reference Books:

1. V.Carl Hammacher, “Computer Organisation”, Fifth Edition.
2. A.S.Tanenbum, “Structured Computer Organisation”, PHI, Third edition
3. Y.Chu, "Computer Organization and Microprogramming", II, Englewood Chiffs, N.J., Prentice Hall Edition
4. M.M.Mano, “Computer System Architecture”, Edition
5. C.W.Gear, “Computer Organization and Programming”, McGraw Hill, N.V. Edition 6. Hayes J.P, “Computer Architecture and Organization”, PHI, Second edition

ECA-501	Computer Architecture	0L:0T:2P	1 credits	2Hrs/Week
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Experiment List-

1. Write the working of 8085 simulator GNUsim8085 and basic architecture of 8085 along with small introduction.
2. Study the complete instruction set of 8085 and write the instructions in the instruction set of 8085 along with examples.
3. Write an assembly language code in GNUsim8085 to implement data transfer instruction.
4. Write an assembly language code in GNUsim8085 to store numbers in reverse order in memory location.
5. Write an assembly language code in GNUsim8085 to implement arithmetic instruction.

ECA-502

Digital Signal Processing

ECA-502	Digital Signal Processing	2L:1T:0P	3 Credits	2Hrs/Week
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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 and W.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988.

ECA-502	Digital Signal Processing	0L:0T:2P	1Credits	2Hrs/Week
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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, Hann, Hamming

ECA-503
CMOS Design

ECA-503	CMOS Design	2L:1T:0P	3 Credits	2Hrs/Week
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Course Preambles:

1. To learn basic CMOS Circuits.
2. To learn CMOS process technology.
3. To learn techniques of chip design using programmable devices.
4. To learn the concepts of designing VLSI Subsystems.

Course Outcomes:

At the end of the course the students will be able to

1. Design different CMOS circuits using various logic families along with their circuit layout.
2. Use tools for VLSI IC design.

UNIT-I(6H)

Review of MOS transistor models, Non-ideal behavior of the MOS Transistor.

UNIT-II (10H)

Transistor as a switch. Inverter characteristics, Integrated Circuit Layout: Design Rules, Parasitics. Delay: RC Delay model, linear delay model, logical path efforts.

UNIT-III (6H)

Power, interconnect and Robustness in CMOS circuit layout.

UNIT-IV (10H)

Combinational Circuit Design: CMOS logic families including static, dynamic and dual rail logic.

UNIT-V (10H)

Sequential Circuit Design: Static circuits. Design of latches and Flip-flops.

‘Text/Reference Books:

1. N.H.E. Weste and D.M. Harris, CMOS VLSI design: A Circuits and Systems Perspective, 4th Edition, Pearson Education India, 2011.
2. C.Mead and L. Conway, Introduction to VLSI Systems, Addison Wesley, 1979.

List of Experiments:

1. Design Universal gates and all other gates using S-edit and getting its transient response
2. Obtain the DC- characteristics of CMOS Inverter using DC-analysis.
3. Design Symbol of CMOS Inverter and using instances of its getting transient response.
4. Design Symbol of Universal gates and using instances of them getting transient response.
5. Design a Transmission gate using PMOS & NMOS by instance calling.
6. Design the Layout of NMOS and PMOS transistor.
7. Design the Layout of CMOS Inverter.

ECA-503	CMOS Design	0L:0T:2P	1 Credits	2Hrs/Week
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LIST OF EXPERIMENTS

- 1 . Familiarization with MOS model parameters in PSPICE software.
- 2 . Simulation of MOS Inverter with different loads using PSPICE software.
- 3 .Simulation of CMOS Inverter for different parameters K_n , K_p as a design variable in PSPICE software.
- 4.Study of the switching characteristics of CMOS Inverter and find out noise margins.
5. Simulate CMOS amplifier using PSPICE software.
6. Layout design of a CMOS Inverter using any layout design tool.
7. Layout design of a 2-input CMOS NAND/NOR gate using any layout design tool.

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

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

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.

ECA-504(B) Nano Electronics

ECA-504(B)	Nano Electronics	3L:1T:0P	4 Credits	2Hrs/Week
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Course Preambles:

The major objectives are to provide students with knowledge and understanding of nano-electronics as an important interdisciplinary subject.

Course Outcomes:

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

1. Understand various aspects of nano-technology and the processes involved in making nano components and material.
2. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
3. Understand various aspects of nano-technology and the processes involved in making nano components and material.
4. Leverage advantages of the nano-materials and appropriate use in solving practical problems.

UNIT-I(10H)

Introduction to nanotechnology, meso structures, Basics of Quantum Mechanics: Schrodinger equation, Density of States.

UNIT-II(10H)

Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig-Penny Model. Brillouin Zones.

UNIT-III(10H)

Shrink-down approaches: Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.).

UNIT-IV(6H)

Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics, Bandstructure and transport, devices.

UNIT-V(6H)

Applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation.

Text/ Reference Books:

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 2009.
2. W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic Materialand Novel Devices), Wiley-VCH, 2003.
3. K.E. Drexler, Nanosystems, Wiley, 1992.
4. J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press, 1998.
5. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, 2003

ECA-505(A)
Data Compression & Cryptography

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

ECA-505(B)
Operating System

ECA-505(B)	Operating System	3L:1T:0P	4 Credits	2Hrs/Week
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Course Preambles:

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication
3. To learn the mechanisms involved in memory management in contemporary OS

Course Outcomes

Students will be able to:

1. Analyze the structure of OS and basic architectural components involved in OS design
2. Analyze and design the applications to run in parallel either using process or thread models of different OS
3. Analyze the various device and resource management techniques for timesharing and distributed systems

UNIT I (10H)

Introduction:- History of operating System, Types of Operating System: Batch Processing, RealTime, Multitasking & Multiprogramming, Time-sharing system, Operating system services, Operating system structure, System Call & System Boots, Operating system design & Implementations, System protection, Buffering & Spooling.

UNIT II (10H)

Processes Management:- The Process concept, The process control block, Systems programmer's view of processes, Operating system services for process management, Scheduling algorithms, FirstCome first serve, Round Robin, Shortest run time next, Highest response ratio next, MultilevelFeedback Queues, Performance evaluation of scheduling algorithms stated above.

UNIT III (10H)

Deadlock:- Characterization, Methods for deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Process Management in Linux. File Management:- File system, access methods, free space managements, allocation methods, directory systems, protection, organization, sharing & implementation issues, Disk & Drum Scheduling, File system in Linux & Windows

UNIT IV (6H)

I/O Management:- I/O devices organization, I/O devices organization, I/O buffering, I/O Hardware, Kernel I/O subsystem, Transforming I/O request to hardware operations. Device Management:- Path managements, Sub module, Procedure, Scheduler, Handler, InterruptService Routine.

UNIT V (6H)

Memory Management:- Memory Hierarchy, MFT & MVT, logical and physical address space, Concept of swapping and Paging, Memory management without swapping or paging, contiguous and non-contiguous allocation, segmentation, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation and paging combined with segmentation. Structure & implementation of Page table, Virtual memory, Cache Memory Organization.

REFERENCES:

1. Silberschatz, "Operating system", Willey Pub.
2. Stuart, "Operating System Principles, Design & Applications", Cengage Learning.
3. Tannanbaum, "Modern operating system", PHI Learning

**Industrial Training-I
ECA-506**

ECA-506	Industrial Training-I (Minor)	0L:0T:4P	2 credits	2Hrs/Week
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Course Preamble:

1. To expose the students to actual working environment of Electronics 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 minimum 15 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

Control Systems ECA-601

ECA-601	Control Systems	2L:1T:0P	3 credits	2Hrs/Week
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Course Preamble

1. The students should be able to learn the type of System, dynamics of physical systems, classification of control system, analysis and design objective.
2. The students should learn how to represent system by transfer function and block diagram reduction method and Mason's gain formula.
3. The students should be able to learn time response analysis and demonstrate their knowledge frequency response.
4. Students can be able to learn stability analysis of system using Root locus, bode plot, polar plot, and Nyquist plot.

Course Outcomes:

1. Identify open and closed loop control system
2. Formulate mathematical model for physical systems.
3. Simplify representation of complex systems using reduction techniques.
4. Use standard test signals to identify performance characteristics of first and second-order systems.
5. Apply root locus technique for stability analysis.
6. Analyze performance characteristics of system using Frequency response methods

UNIT-I(10H)

Introduction to control problem- Industrial Control examples. Transfer function. System with dead-time. System response. Control hardware and their models: potentiometers, synchros, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.

UNIT-II(10H)

Feedback control systems- Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness. proportional, integral and derivative systems. Feedforward and multi-loop control configurations, stability concept, relative stability, Routh stability criterion.

UNIT-III(10H)

Time response of second-order systems, steady-state errors and error constants. Performance specifications in time-domain. Root locus method of design. Lead and lag compensation.

UNIT-IV(6H)

Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.

UNIT-V(6H)

State variable Analysis- Concepts of state, state variable, state model, state models for linear continuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability & observability. Introduction to Optimal control & Nonlinear control, Optimal Control problem, Regulator problem, Output regulator, tracking problem. Nonlinear system – Basic concept & analysis.

Text/Reference Books:

1. Gopal. M., “Control Systems: Principles and Design”, Tata McGraw-Hill, 1997.
2. Kuo, B.C., “Automatic Control System”, Prentice Hall, sixth edition, 1993.
3. Ogata, K., “Modern Control Engineering”, Prentice Hall, second edition, 1991.

ECA-601	Control Systems	0L:0T:2P	1 credits	2Hrs/Week
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Experiment list

1. Overview of the MATLAB Environment for control system.
2. Step Response of 1st and 2nd order systems in MATLAB.
3. Analysis and Designing of bode plot using MATLAB.
4. Analysis and Designing of Root locus using MATLAB.
5. Introduction to Simulink for Control System.
6. To study of PID controller with Simulink.
7. Introduction of State Spaces design in MATLAB.
8. Test of Controllability and Observability.
9. Determination of state transition matrix
10. Introduction to LTI viewer.
11. Design of digital compensators, Lag, Lead

Optical Communication

ECA-602

ECA-602	Optical Communication	2L:1T:0P	3 credits	2Hrs/Week
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Course Preamble

- 1.To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- 2.To understand the different kind of losses, signal distortion, SM fibers.
3. To learn the various optical sources, materials and fiber splicing
4. To learn the fiber optical receivers and noise performance in photo detector.

Course Outcomes:

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

1. Understand the principles fiber-optic communication, the components and the bandwidth advantages.
2. Understand the properties of the optical fibers and optical components.
3. Understand operation of lasers, LEDs, and detectors
4. Analyze system performance of optical communication systems
5. Design optical networks and understand non-linear effects in optical fibers

UNIT-I(10H)

Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model.

UNIT-II(10H)

Different types of optical fibers, Modal analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR.

UNIT-III(10H)

Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.

UNIT-IV(6H)

Optical switches - coupled mode analysis of directional couplers, electro-optic switches. Optical amplifiers - EDFA, Raman amplifier. WDM and DWDM systems. Principles of WDM networks.

UNIT-V(6H)

Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and soliton based communication.

Text/Reference Books

1. J. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
2. T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
3. J. Gowar, Optical communication systems, Prentice Hall India, 1987.
4. S.E. Miller and A.G. Chynoweth, eds., Optical fibres telecommunications, Academic Press, 1979.
5. G. Agrawal, Nonlinear fibre optics, Academic Press, 2nd Ed. 1994.
6. G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, New York, 1997
7. F.C. Allard, Fiber Optics Handbook for engineers and scientists, McGraw Hill, New York (1990).

ECA-602	Optical Communication	0L:0T:2P	1 credits	2Hrs/Week
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List of Experiments:

1. Launching of light into the optical fiber and calculate the numerical aperture and V-number.
2. Observing Holograms and their study.
3. Optic version Mach-Zehnder interferometer.
4. Measurement of attenuation loss in an optical fiber.
5. Diffraction using gratings.
6. Construction of Michelson interferometer.
7. Setting up a fiber optic analog link and study of PAM.
8. Setting up a fiber optic digital link and study of TDM and Manchester coding.
9. Measurement of various misalignment losses in an optical fiber.

**Program Elective-II
Computer Networks
ECA-603(A)**

ECA-603(A)	Computer Networks	3L:1T:0P	4 credits	3Hrs/Week
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Course Preamble

1. Describe the general principles of data communication.
2. Describe how computer networks are organized with the concept of layered approach.
3. Describe how signals are used to transfer data between nodes.
4. Implement a simple LAN with hubs, bridges and switches.

Course Outcomes:

1. Understand the concepts of networking thoroughly.
2. Design a network for a particular application.
3. Analyze the performance of the network

UNIT-I(10H)

Introduction to computer networks and the Internet: Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic mail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts.

UNIT-II(10H)

Switching in networks: Classification and requirements of switches, a generic switch, Circuit Switching, Time-division switching, Space-division switching, Crossbar switch and evaluation of blocking probability, 2-stage, 3-stage and n-stage networks, Packet switching, Blocking in packet switches, Three generations of packet switches, switch fabric, Buffering, Multicasting, Statistical

UNIT-III(10H)

Multiplexing. Transport layer: Connectionless transport - User Datagram Protocol, Connection-oriented transport - Transmission Control Protocol, Remote Procedure Call. Transport layer: Connectionless transport - User Datagram Protocol, Connection-oriented transport - Transmission Control Protocol, Remote Procedure Call.

UNIT-IV(6H)

Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.

UNIT-V(6H)

Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.

Text Reference books:

1. J.F. Kurose and K. W. Ross, “Computer Networking – A top down approach featuring the Internet”, Pearson Education, 5th Edition
2. L. Peterson and B. Davie, “Computer Networks – A Systems Approach” Elsevier Morgan Kaufmann Publisher, 5th Edition.
3. T. Viswanathan, “Telecommunication Switching System and Networks”, Prentice Hall
4. S. Keshav, “An Engineering Approach to Computer Networking” , Pearson Education
5. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition
6. Andrew Tanenbaum, “Computer networks”, Prentice Hall
7. D. Comer, “Computer Networks and Internet/TCP-IP”, Prentice Hall
8. William Stallings, “Data and computer communications”, Prentice Hall

**Information Theory and Coding
ECA-603(B)**

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

1. Understand error-control coding.
2. Understand encoding and decoding of digital data streams.
3. Be familiar with the methods for the generation of these codes and their decoding techniques.
4. Be aware of compression and decompression techniques.
5. Learn the concepts of multimedia communication.

Course Outcomes:

1. Design an application with error-control.
2. Use compression and decompression techniques.
3. Apply the concepts of multimedia communication

UNIT-I (10H)

INFORMATION THEORY:

Entropy, Information rate, source coding: Shannon-Fano and Huffman coding techniques, Mutual Information, Channel capacity of Discrete Channel, Shannon- Hartley law, Trade-off between bandwidth and SNR.

UNIT-II (10H)

ERROR CONTROL CODES:

Examples of the use of error control codes, basic notations, coding gain, Characterization of Error control codes, performance of error control codes, comparison of uncoded and coded systems.

UNIT-III (10H)

LINEAR BLOCK CODES:

Linear block codes and their properties, standard arrays, syndromes, weight distribution. Error detection/correction properties, modified linear block codes.

UNIT-IV (6H)

CONVOLUTION CODES:

Convolution encoders, structural properties of convolution codes, trellis diagrams, Viterbi algorithm, performance analysis.

CYCLIC CODES:

General theory, Shift Register Implementations, Shortened Cyclic codes, CRCs for Error Detection.

UNIT-V (6H)

BCH AND RS CODES:

Algebraic Description, Frequency Domain Description, Decoding Algorithms for BCH and RS Codes.

REFERENCE BOOKS:

- [1] John Proakis, "Digital Communications", TMH, 5th Ed.,2008.
- [2] Simon Haykin, "Communication System", Wiley, 2008.
- [3] Jorge Castineira, Moreira, "Essentials of Error Control Coding", Wiley, 2006.

Digital Image & Video Processing
ECA-604(A)

ECA-602	Optical Communication	3L:0T:0P	3 credits	3Hrs/Week
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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 and acquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.

UNIT-II (10H)

Image Enhancements and Filtering-Gray level transformations, histogram equalization 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 boundary detection, thresholding – global and adaptive, region-based segmentation.

UNIT-IV (6H)

Wavelets and Multi-resolution image processing- Uncertainty principles of Fourier Transform, Time frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Subband filter banks, wavelet packets. Image Compression-Redundancy– inter-pixel and psycho-visual; Lossless compression – 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 estimation techniques – full search, 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-cuts and 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
ECA-604(B)

ECA-604(B)	Optical Communication	3L:0T:0P	3 credits	3 Hrs/Week
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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 on reflection 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 Encoders 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, Wiley-Interscience, 2003.

**Introduction to MEMS
ECA-605(A)**

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

Bio-Medical Electronics
ECA-605(B)

ECA-605(B)	Bio-Medical Electronics	3L:0T:0P	3 credits	3Hrs/Week
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Course Preamble

1. To introduce the basic concepts related to the operation of electrical & electronic measuring instruments.
2. To understand operational and application aspects of CRO (normal and storage).
3. To analyze and apply various AC bridges for the measurements of various physical quantities minimizing errors by following proper precautions.
4. To study the principles behind various transducers and their applications in the measurement of various parameters in electrical and mechanical engineering fields.

Course Outcomes

1. Understand the basic concepts of electrical units, measurement errors and accuracy.
2. Measure different physical parameters using different transducers.
3. Gain experience in interpreting technical specifications and selecting sensors and transducers for a given application.
4. Apply the principles and practice for instrument design and develop for real world problems.

UNIT-I (10H)

Measurements & Errors: Significance of measurements, methods of measurements: Direct & indirect methods, Mechanical, Electrical, Electronic Instruments, Classification of instruments, Deflection & null type, Characteristics of instruments: accuracy, precision, drift, span & range, Significant Figures, Static Sensitivity, Linearity, hysteresis, Threshold, Dead zone, Resolution, Loading effect etc. Error & its types: Gross systematic error: Instrumental Error, Environmental error, observational error. Random error: Arithmetic mean, Range, deviation, Average deviation, Standard deviation, variance etc.

UNIT-II (10H)

CRO & Measurements: Basic CRO Circuit, Dual trace Oscilloscope, Dual beam Oscilloscope, Sampling Oscilloscope, Analog Storage Oscilloscope, Digital Storage Oscilloscope. Measurement with CRO: Frequency, Voltage, Current, Phase, Dielectric, Frequency ratio etc. A.C Bridges: General equation for bridge balance, Measurement of inductance, Capacitance and Q of the coil, Capacitance Maxwell's, Wiens, Schering Bridge, Wagner Earth Tester.

UNIT-III (10H)

Signal generator, function generator, sweep frequency generator, pulse and square wave generator, wave analyzers, harmonic distortion analyzer, spectrum analyzer, heterodyne frequency meter, frequency counter, measurement errors, automatic and computing counter, Digital voltmeter, Ramp type DVM, Integrating DVM, successive approximation DVM.

UNIT –IV (6H)

Transducer: Electrical transducers, classification of transducers, resistive transducer, resistance thermometers, thermistors, thermocouples, Inductive transducer, LVDT, Capacitive, piezoelectric, hall effect transducers. Measurement of non Electrical quantity: Displacement, strain, flow measurements, Rota meter, Venturi meter, Bourdon tube pressure transducer, temperature.

UNIT-V (6H)

Sensors: Gas Sensor, NBA agent, Microbial sensor, electro analytical sensor, Enzyme based sensor-glucose sensor, Electronic nose –halitosis, breath analysis. Advances in sensor technology: lab –on –a chip, smart sensor, MEMS and Nano sensor. Radiation sensor , Thermal radiation sensor.

Reference Books:

1. Electrical Electronics Measurement & Measuring Instrumentation by A.K Shawney.
2. Electronics & Instrumentation Measurement by J.B Gupta.
3. Instrumentation & Measurement by Helfrick Cooper, PHI India
4. Electronics Instrumentation, H.S. Kalasi, TMH India
5. Biomedical senses & Measurement by Wane, Pind, Liu, Sprinper.
6. Measurement, Instrumentation, and Sensors Handbook, Second Edition: Two Volume Set John G. Webster, Halit Eren, CRC Press
7. Measurement System by Doebelin, Tata McGraw-Hill Education
8. Biosensors: Theory and Applications, Donald G. Buerk, by CRC Press
9. Fundamentals of Instrumentation 2nd Edition by NJATC, Cengage Learning; 2 edition

**Minor Project
ECA-606**

ECA -606	Project-I (Minor)	0L:0T:4P	2 credits	6Hrs/Week
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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.
2. design work with a focus on electronic circuit design.
3. The Minor project may be a complete hardware or a combination of hardware and software.
4. The software part in Minor project should be less than 50% of the total work.
5. Minor Project should cater to a small system required in laboratory or real life.
6. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
7. 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.
8. 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.
9. The student is expected to exert on design, development and testing of the proposed work as
10. per the schedule.
11. Art work and Layout should be made using CAD based PCB simulation software. Due
12. considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design.

SEMESTER – VII

Microwave Theory and Techniques ECA-701

ECA-701	Microwave Theory and Techniques	3L:0T:P	3 credits	3Hrs/Week
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Course Preambles:

1. To understand Analysis of Waveguides and gain complete knowledge about Microwave Components.
2. Design of Impedance Matching and Tuning using lumped and distributed elements for network.
3. To Analysis and study characteristics of microwave tube Generators and Amplifiers.
4. To Analysis and study characteristics of microwave Semiconductor of detector, switch, generator and amplifier.
5. Study different RADARs and its supporting systems.
6. Study various applications of microwave engineering.

Course Outcomes:

1. Understand various microwave system components their properties.
2. Appreciate that during analysis/ synthesis of microwave systems, the different mathematical treatment is required compared to general circuit analysis.
3. Design microwave systems for different practical application.

UNIT-I (10H)

Introduction to Microwaves-History of Microwaves, Microwave Frequency bands;Applications of Microwaves: Civil and Military, Medical, EMI/ EMC. Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission. Analysis of RF and Microwave Transmission Lines- Coaxial line, Rectangular waveguide, Circular waveguide, Strip line, Micro strip line.

UNIT-II (10H)

Microwave Network Analysis- Equivalent voltages and currents for non-TEM lines, Network parameters for microwave circuits, Scattering Parameters. Passive and Active Microwave Devices- Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator. Microwave active components: Diodes, Transistors, Oscillators, Mixers. Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes. Microwave Tubes: Klystron, TWT, Magnetron.

UNIT-III (10H)

Microwave Design Principles- Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power Amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas- Antenna parameters, Antenna for ground based systems, Antennas for airborne and satellite borne systems, Planar Antennas.

UNIT-IV (6H)

Microwave Measurements- Power, Frequency and impedance measurement at microwave frequency, Network Analyzer and measurement of scattering parameters, Spectrum Analyzer and measurement of spectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure. Measurement of Microwave antenna parameters.

UNIT-V (6H)

Microwave Systems- Radar, Terrestrial and Satellite Communication, Radio Aid to Navigation, RFID, GPS. Modern Trends in Microwaves Engineering- Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Monolithic Microwave ICs, RFMEMS for microwave components, Microwave Imaging.

Text/Reference Books:

1. R.E. Collins, Microwave Circuits, McGraw Hill
2. K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech house

ECA-701	Microwave Theory and Techniques	0L:0T:2P	1 credits	2 Hrs/Week
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List of Experiments

1. To study the microwave test bench and its components.
2. To Study the characteristics of Klystron Tube and to determine its electronic tuning range.
3. To determine the frequency and wavelength in a rectangular wave-guide working on TE₁₀ mode.
4. To study the V-I characteristics of Gunn Diode.
5. Study the function of Magic Tee by measuring the following parameters.
 - (a) Measurement of VSWR at different ports and
 - (b) Measurement of isolation and coupling coefficient.
6. Study the function of Isolator by measuring the following parameters.
 - (a) Input VSWR measurement of Isolator .
 - (b) Measurement of insertion loss and isolation.
7. Study the function of Attenuator (Fixed and Variable type) by measuring the following parameters.
 - (a) Input VSWR measurement.

- (b) Measurement of insertion loss and attenuation.
- 8. Study the function of Two Hole Directional Coupler by measuring the following parameters.
 - (a) To measure main line and auxiliary line VSWR.
 - (b) To measure the coupling factor and directivity.
- 9. Study the function of Circulator by measuring the following parameters.
 - (a) Input VSWR measurement of Circulator.
 - (b) Measurement of insertion loss and isolation.
- 10. To determine the Standing Wave-Ratio and reflection coefficient

**Antennas and Propagation
ECA-702**

ECA-702	Antennas and Propagation	3L:0T:0P	3 Credit	3Hrs/Week
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Course Preambles:

1. Students will be introduced to antennas, their principle of operation
2. Antenna analysis and their applications.
3. Introduce the student to wave propagation over ground, through troposphere and ionosphere; diversity principles,
4. Propagation effects in microwave systems, satellite, space, and radar links

Course Outcomes:

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

1. Understand the properties and various types of antennas.
2. Analyze the properties of different types of antennas and their design.
3. Operate antenna design software tools and come up with the design of the antenna of required specifications

UNIT-I (10H)

Fundamental Concepts- Physical concept of radiation, Radiation pattern, near-and-far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions. Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.

UNIT-II(10H)

Aperture and Reflector Antennas- Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas. Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.

UNIT-III (10H)

Micro strip Antennas- Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.

UNIT-IV (6H)

Antenna Arrays- Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkunoff polynomial method, Woodward-Lawson method.

UNIT-V (6H)

Basic Concepts of Smart Antennas- Concept and benefits of smart antennas, fixedweight beam forming basics, Adaptive beam forming. Different modes of Radio Wave propagation used in current practice.

Text/Reference Books:

1. J.D. Kraus, Antennas, McGraw Hill, 1988.
2. C.A. Balanis, Antenna Theory - Analysis and Design, John Wiley, 1982.
3. R.E. Collin, Antennas and Radio Wave Propagation, McGraw Hill, 1985.
4. R.C. Johnson and H. Jasik, Antenna Engineering Handbook, McGraw ill, 1984.
5. I.J. Bahl and P. Bhartia, Micro Strip Antennas, Artech House, 1980.
6. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill, 2005
7. R.E. Crompton, Adaptive Antennas, John Wiley

Antennas and Propagation ECA-701

ECA-702	Antennas and Propagation	0L:0T:1P	1 Credit	2Hrs/Week
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List of Experiments

Following illustrative practical should be simulated with the help of any RF simulation software e.g. FEKO / HFSS / IE3D / Microwave Office / Microwave Studio or any other similar software:-

1. To Plot the Radiation Pattern of an Omni Directional Antenna.
2. To Plot the Radiation Pattern of a Directional Antenna.
3. To Plot the Radiation Pattern of a Parabolic Reflector Antenna.
4. To Plot the Radiation Pattern of a Log Periodic Antenna.
5. To Plot the Radiation Pattern of a Patch Antenna.
6. To Plot the Radiation Pattern of a Dipole/ Folded Dipole Antenna.
7. To Plot the Radiation Pattern of a Yagi (3-EL/4EL) Antenna.
8. To Plot the Radiation Pattern of a Monopole/ WHIP/ Collinear Antenna.
9. To Plot the Radiation Pattern of a Broad site Antenna.
10. To Plot the Radiation Pattern of a Square Loop Antenna

Program Elective-IV

Satellite Communication ECA-703(A)

ECA-703(A)	Mixed Signal Design	3L:0T:0P	3 Credit	3Hrs/Week
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Course Preambles

1. To provide an in-depth understanding of different concepts used in a satellite communication system.
2. To explain the tools necessary for the calculation of basic parameters in a satellite communication system.
3. To get knowledge of every aspects of satellite communication like orbital mechanics, launching techniques, satellite link design, earth station technology and different access system towards a satellite.

Course Outcomes:

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

1. Visualize the architecture of satellite systems as a means of high speed, high range communication system.
2. State various aspects related to satellite systems such as orbital equations, sub-systems in a satellite, link budget, modulation and multiple access schemes.
3. Solve numerical problems related to orbital motion and design of link budget for the given parameters and conditions.

UNIT-I (10H)

Introduction to Satellite Communication: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication.

UNIT-II (6H)

Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.

UNIT-III (6H)

Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.

UNIT-IV (10)

Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift. Satellite link budget Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.

UNIT-V (10)

Modulation and Multiple Access Schemes: Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.

Text /Reference Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002
2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009
3. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill, 2009

**Mixed Signal Design
ECA-703 (B)**

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

Wireless Sensor Networks ECA-704(A)

ECA-704(A)	Wireless Sensor Networks	3L:0T:0P	3 Credit	3Hrs/Week
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Course Preambles

- 1.Introduction to planning and design of wireless networks
2. Introduction to HSPA systems
3. To study emerging technologies like Bluetooth, zigbee, Wimax
4. Understanding the wireless sensor network architecture and the protocol stack and WSN applications.

Course Outcomes:

1. Design wireless sensor networks for a given application
2. Understand emerging research areas in the field of sensor networks
3. Understand MAC protocols used for different communication standards used in WSN
4. Explore new protocols for WSN

UNIT-I (10H)

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT-II (10H)

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

UNIT-III (10H)

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee,

UNIT-IV (6H)

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

UNIT-V (6H)

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware

components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.

Text/Reference Books:

1. Waltenegus Dargie , Christian Poellabauer, “Fundamentals Of Wireless Sensor Networks Theory And Practice”, By John Wiley & Sons Publications ,2011
2. Sabrie Soloman, “Sensors Handbook" by McGraw Hill publication. 2009
3. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks”, Elsevier Publications,2004
4. Kazem Sohrby, Daniel Minoli, “Wireless Sensor Networks”: Technology, Protocols and Applications, Wiley-Inter science
5. Philip Levis, And David Gay "TinyOS Programming" by Cambridge University Press 2009

High Speed Electronics
ECA-704(B)

ECA-704(B)	High Speed Electronics	3L:0T:0P	3 Credit	3Hrs/Week
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Course Preambles

To give a fundamental understanding of the new high speed semiconductor circuits which are now being developed and forms a basis for the development of high capacity cost efficient interactive multimedia system operated above 20 GHz

Course Outcomes:

1. Understand significance and the areas of application of high-speed electronics circuits.
2. Understand the properties of various components used in high speed electronics
3. Design High-speed electronic system using appropriate components.

UNIT-I (10H)

Transmission line theory (basics) crosstalk and nonideal effects; signal integrity: impact of packages, vias, traces, connectors; non-ideal return current paths, high frequency power delivery. methodologies for design of high speed buses; radiated emissions and minimizing system noise; Noise Analysis: Sources, Noise Figure, Gain compression, Harmonic distortion, Intermodulation, Cross-modulation, Dynamic range

UNIT-II (10H)

Devices: Passive and active, Lumped passive devices (models), Active (models, low vs high frequency)

UNIT-III (10H)

RF Amplifier Design, Stability, Low Noise Amplifiers, Broadband Amplifiers (and Distributed) Power Amplifiers, Class A, B, AB and C, D E Integrated circuit realizations, Cross-over distortion Efficiency RF power output stages

UNIT-IV (6H)

Mixers – Upconversion Downconversion, Conversion gain and spurious response. Oscillators Principles. PLL Transceiver architectures

UNIT-V (6H)

Printed Circuit Board Anatomy, CAD tools for PCB design, Standard fabrication, Microvia Boards. Board Assembly: Surface Mount Technology, Through Hole Technology, Process Control and Design challenges.

Text/Reference Books:

1. Stephen H. Hall, Garrett W. Hall, James A. McCall “High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices”, August 2000, Wiley-IEEE Press
2. Thomas H. Lee, “The Design of CMOS Radio-Frequency Integrated Circuits”, Cambridge University Press, 2004, ISBN 0521835399.
3. Behzad Razavi, “RF Microelectronics”, Prentice-Hall 1998, ISBN 0-13-887571-5.
4. Guillermo Gonzalez, “Microwave Transistor Amplifiers”, 2nd Edition, Prentice Hall

Project Stage-I
ECA-705

ECA -705	Project-I	0L:0T:10P	5 credits	8Hrs/Week
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Course Outcomes:

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

1. Design and validate Electronics 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

ECA-706

ECA-706	Self-Study/GD/Seminar	0L:0T:2P	1 credits	1Hrs/Week
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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 recognizing cultural diversity and the ever-changing nature of what is regarded as important

SEMESTER-VIII

T.V & Radar Engineering ECA-801

ECA-801	T.V & Radar Engineering	3L:0T:0P	3 credits	3Hrs/Week
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Course Preamble:

1. To introduce the basics of picture transmission and reception, analysis and synthesis of composite video signal, receiver and picture tubes and television camera tubes.
2. To study various colour television systems with greater emphasis on television standards
3. To become well conversant with new development in digital video engineering.
4. To introduce advanced TV systems, MAC signals and direct to home TV technology.
5. To introduce most latest and revolutionary ideas in the field of digital TV, HDTV, WDTV.
6. To study various display system and its application.

Course Outcomes:

1. Understand the fundamental concepts of television transmitter and receiver systems, the transmission of video signals and importance of television standards to effectively work with broadcasting applications, trouble shooting of television systems.
2. Understand different colour television systems used worldwide and its compatibility.
3. Understand principles of digital video and component video signal.
4. Understand advanced TV technology, MAC signals and DTH technology.
5. Describe and differentiate working principles of latest digital TV, HDTV, and WDTV.
6. Understand the working principles and applications of latest display like LCD, LED, Plasma and large flat panel monitors.

Unit I : Basic Television System (10H)

Introduction: Scanning principles: sound and picture transmission, scanning process, camera pick-up devices, video signal, transmission and reception of video signals, brightness perception and photometric quantities, aspect ratio and rectangular scanning, persistence of vision and flicker, vertical resolution, the Kell factor, horizontal resolution and video bandwidth, interlaced scanning.

Composite Video Signal: Lines and scanning, video signal components, horizontal sync and blanking standards, vertical sync and blanking standards, video modulation and vestigial side band signal, sound modulation and inter-carrier system.

Television Standards: Standard channel characteristics, reception of the vestigial side band signals, television broadcast channel, consolidated CCIR system-B standard, various television broadcast systems.

Television Pick-up devices and Cameras: Camera lenses, auto-focus systems, television camera pick-ups, Silicon Vidicon, CCD image sensors, video processing of camera pick-up signal.

Unit II : Colour Television (10H)

Colour fundamentals: mixing of colours and colour perception, chromaticity diagram, colour television camera, colour TV signals and transmission, NTSC, SECAM and PAL system, Trinitron picture tube, automatic degaussing, plasma, LCD displays.

Television transmission and reception: requirement of TV broadcast transmission, design principle of TV transmitters, IF modulation, power output stages, block diagram of TV transmitter, co-channel interference and ghost images during propagation of television signals, antenna requirements for television system, block schematic and function requirements for television receivers, trends in circuit design, colour television receiver.

Unit III : Digital Television Technology(10H)

Merits of digital technology, fully digital television system, digital television signals, digitized video parameters, digital video hardware, transmission of digital TV signals, bit rate reduction, digital TV receivers, video processor unit, audio processor unit.

Other television systems: Closed Circuit television system (CCTV), Cable television system (CATV), multiplexed analog component encoding television system (MAC TV), High definition television system (HDTV), High definition multiplexed analog component television (HD-MAC TV), High Performance Computer Controlled TV (HPCC TV), 3-D stereoscopic television techniques..

Unit IV : RADAR (6H)

The Radar range equation, block diagram and operation, performance factors: prediction of range performance, minimum detectable signal, receiver noise, probability density functions, signal to noise ratios. Radar cross section of targets, transmitter power, pulse repetition frequency and range ambiguities, antenna parameters.

The CW radar: the Doppler effect, FM-CW radar. The Moving Target Indicator (MTI) Radar: delay line cancellers.

Unit V : Radar Receivers (6H)

The radar receiver, noise figure, mixers, low noise front ends, displays- type A and PPI representations, duplexer and receiver protectors.

Other Radar systems: Synthetic aperture radar, HF over the horizon radar, Air Surveillance Radar (ASR), Bistatic radar.

References:

1. M. Dhake: Television and Video Engineering, 2nd Edition, TMH, New Delhi.
2. M. I. Skolnik: Introduction to Radar Systems, TMH, New Delhi.
3. R. G. Gupta: Television Engineering and Video Systems, TMH, New Delhi.
4. R. R. Gulati: Monochrome and Colour Television, New Age International.
5. Grob and Herndon: Basic Television and Video Systems, McGraw Hill International.
6. P. Z. Peebles, Jr.: Radar Principles, Wiley India Pvt. LTD.
7. Edde: Radar- Principles, Technology Applications, Pearson Education.

ECA-801	T.V & Radar Engineering	0L:0T:2P	1 credits	3Hrs/Week
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List of Experiments:

Section A: Television Engg.

1. (a) To Study the Circuit Description of RF Tuner Section.
(b) To Study the RF Section by Measuring Voltages at Various Test Points.
(c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for RF Section.
2. (a) To Study the Circuit Description of VIF Tuner Section.
(b) To Study the VIF Section by Measuring Voltages at Various Test Points.
(c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for VIF Section.
3. (a) To Study the Circuit Description of Video and Chroma Section Tuner Section.
(b) To Study the Video and Chroma Section by Measuring Voltages at Various Test Points
(c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Video and Chroma Section.
4. (a) To Observe the Horizontal Oscillator and Horizontal Output Section through Various Test Point.
(b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Horizontal Oscillator and Horizontal Output Section.
5. (a) To Observe the Vertical Oscillator and Vertical Output Section through Various Test Point.
(b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Vertical Oscillator and Vertical Output Section.

6. To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Sound Output Section.
7. To Study the Circuit Description of Audio and Video Section Tuner Section.
8. (a) To Study the System Control Section by Measuring Voltages at Various Test Points.
(b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for System Control Section.

Section B: RADAR

1. Study of Doppler Effect.
2. To Measure Speed of a fan and various Other Objects (Pendulum, Tuning Fork, Plate etc.)
3. To Simulate the Variable Speed of Moving Objects using Velocity Simulator.

Program Elective-V
Mobile Communication and Networks

ECA-802(A)

ECA-802(A)	Mobile Communication and Networks	3L:0T:0P	3 credits	3Hrs/Week
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Course Preamble:

1. To understand the basic cellular system concepts.
2. To have an insight into the various propagation models and the speech coders used in mobile communication.
3. To understand the multiple access techniques and interference Education techniques in mobile communication.

Course Outcomes:

1. Discuss cellular radio concepts.
2. Identify various propagation effects.
3. To have knowledge of the mobile system specifications.
4. Classify multiple access techniques in mobile communication.
5. Outline cellular mobile communication standards.
6. Analyze various methodologies to improve the cellular capacity

UNIT- I (10H)

Overview of OSI Model : Significance of layered Model , PDUs, SDUs, IDUs, Higher layer Protocols. Switching and Components. Introduction, Applications, history, of wired & wireless Communication systems. Radio Transmission: frequencies ,signal propagation, antenna , types of modulation, FHSS, DSSS. Multiple Access technology for Wireless Communication FDMA, TDMA, CDMA Cellular System: Introduction, types.

UNIT-II(10H)

Mobile Data Communication: Cellular Telephony, Structure, Fading, Small scale fading, Multi-path Fading, Speech Coding, Error Coding and Correction, Hand off Management, Switching and authentication, MTSO interconnections, frequency hopping, frequency reuse. Circuit Switched Data Services & Packet Switched Data Services on Cellular Networks, Personal Communication Systems (PCS) Architecture, Digital Enhanced Cordless Telecommunications (DECT,) Personal Access Comm. System (PACS).

UNIT-III(10H)

Digital Cellular Systems and Standards: GSM System overview, Architecture, GSM Protocol Model, GSM Mobility Management, SMS security aspects. Broadcast System overview. General Packet Service (GRPS) Architecture, GRPS Network, Interfaces and Procedures (2.5 G), 3G Mobile Services: UMTS and International Mobile Telecommunications (IMT-2000), W-C DMA and CDMA 2000, Quality of service in 3G .

UNIT- IV(6H)

WLAN : Components and working of Wireless LAN, Transmission Media for WLAN, Infrastructure & types of WLAN, IEEE 802.11 Standards , Protocols for WLAN ,MACA,MACAW, Infrared technology. Wireless Application Protocol (WAP) model, architecture, Gateway, WAP protocols and WML

UNIT-V(6H)

Introduction to Bluetooth technology. Wireless in Local Loop (WLL) architecture, products. Satellite as a switch, Components of VSAT system, VSAT topologies, access schemes.

BOOKS

1. Jochen Schiller “Mobile Communication”, Pearson Education.
2. Yi –Bing Lin and Imrich Chlamtac “Wireless and Mobile Network Architectures”, Wiley India.
3. Raj Pandaya “Mobile and Personal Communication System & Services”.
4. Uwe Hansmann, Lothar Merk “Principles of Mobile Computing” 2nd Ed. Wiley India.
5. Roger L. Freeman “ Telecom Transmission handbook” 4th ed. 1998 John Wiley & Sons Inc. New York.
6. Lee “Mobile Cellular Telecom” 1995 Mc Graw Hill.

**Embedded systems
ECA-802 (B)**

ECA-802(B)	Embedded systems	3L:0T:0P	3 credits	3Hrs/Week
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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.
6. Sriram V Iyer, Pankaj Gupta, "Embedded Realtime Systems Programming", TMH.

CAD of Digital Systems

ECA-803 (A)

ECA-803(A)	CAD of Digital Systems	3L:0T:0P	3 credits	3Hrs/Week
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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, Venkateshwarn N; Computer Integrated Mfg; PHI
6. Radhakrishnan P, Subramanian S and Raju V; CAD/CAM

Engineering and Acoustics

ECA-803 (B)

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

ECA-804

ECA- 804	Projects –II (Major)	0L:0T:16P	8 credits	12Hrs/Week
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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 or jointly 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
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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.	<ul style="list-style-type: none"> • 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
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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 Jawaharlal 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

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(09) Assessment

PO/ Course Assessment Tools Types	PO/Course Assessment Tools	PO 1	PO 2	PO3	PO4	P O 5	PO 6	PO7	P O 8	PO 9	PO10	PO1 1	PO 12
		Eng ineer ing Kno wle dge	Pr obl em An aly sis	Design/ Develo pment of Solutio n	Inve stiga tion	M od er n To ol Us age	Th e En gin eer and So cie ty	Envi ron ment and Sust aina bilit y	Et hi cs	Ind ivid ual and Tea m Wo rk	Com muni cation	Proj ect Man age men t	Lif e- Lo ng Le arn ing
Dire ct Tool s	Test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
	Assignm ents	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>				<input type="checkbox"/>			
	lab /seminar/ industrial training/p rojects(R ubrics)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Indi rect Tool s	Course end survey	<input type="checkbox"/>				<input type="checkbox"/>		<input type="checkbox"/>					
	Exit survey	<input type="checkbox"/>	<input type="checkbox"/>										<input type="checkbox"/>
	Faculty Survey		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>					
	Alumni Survey	<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
	Program Statistics	<input type="checkbox"/>			<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>	