GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI.

Department of Electronics and Telecommunication Engineering.

Scheme for B. Tech. (Electronics and Telecommunication)

SEM III

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
SHU303	**Engineering Mathematics - III**	**3**	**--**	**---**	**3**	**10**	**15**	**15**	**60**	**---**	**---**	**100**	**3**
ETU301	Network analysis	3	---	---	3	10	15	15	60	---	---	100	3
ETU302	Components ,Devices and Instruments Technology	3	1	---	4	10	15	15	60	---	---	100	4
ETU303	Electronics Devices and Circuits	3	1	---	4	10	15	15	60	---	---	100	4
ETU304	Digital Electronics	3	---	---	3	10	15	15	60	---	---	100	3
SHU305	General Proficiency - II	1	---	2	3	---	---	---	---	25	25	50	2
ETU305	Network analysis Lab	---	---	2	2	---	---	---	---	50	---	50	1
ETU306	Components ,Devices and InstrumentsTechnology Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU307	Electronics Devices and Circuits Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU308	Digital Electronics Lab	---	---	2	2	---	---	---	---	25	25	50	1
Total		**16**	**2**	**10**	**28**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**

SEM IV

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	
SHU401	Engineering Mathematics - IV	3	--	---	3	10	15	15	60	---	---	100	3
ETU401	Signals and Systems	3	1	---	4	10	15	15	60	---	---	100	4
ETU402	Analog Circuits	3	1	---	4	10	15	15	60	---	---	100	4
ETU403	Microprocessor and its Interfacing	3	---	---	3	10	15	15	60	---	---	100	3
ETU404	Control System Engineering	3	---	---	3	10	15	15	60	---	---	100	3
ETU405	Object Oriented Programming Lab	1	---	2	3	---	---	---	---	50	-	50	2
ETU406	Signals and Systems Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU407	Analog Circuits Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU408	Microprocessor and its Interfacing Lab	---	---	2	2	---	---	---	---	25	25	50	1

ETU409	Control System Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
Total		**16**	2	**10**	**28**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Contineous Assessment ESE Duration for Th: 2Hrs 30Min

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SEM V

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
ETU501	Linear Integrated Circuits &Applications	3	---	---	3	10	15	15	60	---	---	100	3
ETU502	Analog Communication	3	---	---	3	10	15	15	60	---	---	100	3
ETU503	Power Electronics	3	---	---	3	10	15	15	60	---	---	100	3
ETU504	Microcontroller and Its Applications	3	---	---	3	10	15	15	60	---	---	100	3
ETU505	Humanities and Economics	3	---	---	3	10	15	15	60	---	---	100	3
ETU506	Linear Integrated Circuits &Applications Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU507	Analog CommunicationLab	---	---	2	2	---	---	---	---	25	---	25	1
ETU508	Power Electronics Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU509	Microcontroller and Its Applications Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU510	Data Sructure Lab	1	---	2	3	---	---	---	---	25	25	50	2
ETU511	Self Study - I	---	---	----	---	---	---	---	---	25	---	25	2
Total		**16**	---	10	**26**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**

ETU511 Self Study- I is based on one class test each on the basis of 20 % curriculum of the courses ETU501 to ETU504 declared by respective course coordinator at the beginning of semester.One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week

SEM VI

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
ETU601	Electromagnetic Fields	3	--	---	3	10	15	15	60	---	---	100	3

ETU602	Audio & Video Engineering	3	---	---	3	10	15	15	60	---	---	100	3
ETU603	Electronics Measurement	3	---	---	3	10	15	15	60	---	---	100	3
ETU604	Digital Signal Processing	3	---	---	3	10	15	15	60	---	---	100	3
ETU605	Industrial Management and Operation Research	3	---	---	3	10	15	15	60	---	---	100	3
ETU606	Audio & Video Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU607	Electronics Measurement Lab	---	---	2	2	---	---	---	---	25	---	25	1
ETU608	Digital Signal Processing Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU609	Circuit Simulation Lab	---	---	2	2					25	25	50	1
ETU610	Mini Project	----	----	2	2	---	----	---	----	25	25	50	2
ETU611	Self Study - II	---	---	----	---	---	---	---	---	25	---	25	2
ETU612	Industrial Lecture - I	1	---	----	1	---	---	---	---	---	---	---	---
Total		**16**	**---**	10	**26**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**

1) ETU611 Self Study- II is based on one class test each on the basis of 20 % curriculum of the courses ETU601 to ETU604 declared by respective course coordinator at the beginning of semester . One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week

2) Assessment of ETU612 Industrial Lecture- I is scheduled in VIIth semester with ETU711 Industrial Lecture- II

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Contineous Assessment ESE Duration for Th: 2Hrs 30Min

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SEM VII

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical		Total	
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE		
ETU701	Digital System Design	3	---	---	3	10	15	15	60	---	---	100	3
ETU702	Digital Communication	3	---	---	3	10	15	15	60	---	---	100	3
ETU703	Elective - I	3	---	---	3	10	15	15	60	---	---	100	3
ETU704	Interdisciplinary Elective	3	---	---	3	10	15	15	60	---	---	100	3
ETU705	Digital System Design Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU706	Digital Communication Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU707	Elective - I Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU708	Project Phase - I	---	---	4	4	---	---	---	---	50	--	50	2

ETU709	Seminar	---	---	2	2	---	---	---	---	25	25	50	2
ETU710	Industrial training/ Visit	---	---	---	---	---	---	---	---	50	---	50	1
ETU711	Industrial Lecture - II	1	---	---	1	---	---	---	---	25	---	25	1**
ETU712	Self Study - III	---	---	---	----	---	---	---	---	25	---	25	2
Total		13	---	12	25	40	60	60	240	250	100	750	23

1) ETU712 Self Study - III is based on one class test each on the basis of 20 % curriculum of the courses ETU701 to ETU703 declared by respective course coordinator at the beginning of semester. One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week
2) Credit shall be awarded on the basis of combined assessment of ETU612 Industrial Lecture - I and ETU711 Industrial Lecture - II
3) Students of this department shall select any one Interdisciplinary Elective offered by other department. Interdisciplinary Elective shown below will be offered to students of other department.

SEM VIII

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
ETU801	Computer Network and Communication	3	---	---	3	10	15	15	60			100	3
ETU802	Microwave Engineering.	3	---	---	3	10	15	15	60	---	---	100	3
ETU803	Elective - II	3	---	---	3	10	15	15	60	---	---	100	3
ETU804	Elective - III	3	---	---	3	10	15	15	60	---	---	100	3
ETU805	Computer Network and Comm. Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU806	Microwave Engineering. Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU807	Elective - II and Elective - III Lab	---	---	2	2	---	---	---	---	25	25	50	1
ETU808	Project	---	---	6	6	---	---	---	---	75	100	175	6
ETU809	Self Study - IV	---	---	---	---	---	---	---	---	25	----	25	2
Total		12	---	12	24	40	60	60	240	175	175	750	23

ETU809 Self Study - IV is based on one class test each on the basis of 20 % curriculum of the courses ETU801 to ETU804 declared by respective course coordinator at the beginning of semester. One faculty member shall be appointed as course coordinator for self study and his/her teaching workload shall be considered one hour/week

TA :Teacher Assessment CT: Class Tests ESE: End Semester Examination ICA : Internal Contineous Assessment ESE Duration for Th: 2Hrs 30Min

ETU704 Interdisciplinary Elective	ETU703 Elective - I	ETU803 Elective - II	ETU804 Elective - III
A.Electronics Instruments and Applications	A.Fibre Optic Communication	A. Wireless Communication	A. Sattelite Communication Systems
B.Industrial Electronics	B.Embedded System	B. VLSI Design	B. Modern Electronic Design Technique
	C.System Software	C. Open Source Operating system	C. Antenna and Radar
	D.Artificial Intelligence	D .Fuzzy Logic and Neural Network	D. Digital Image Processing
	E.Bio Medical Engineering	E. Bio Informatics	E .Industrial Automation

SHU303 ENGINEERING MATHEMATICS-III

Teaching Scheme: 03 L TOTAL 03 Credit : 03
Marking scheme: 15CT1 + 15CT2 + 10TA + 60 ESE Total Marks :100
Duration of ESE : 2Hrs.30min

Linear Differential Equations with constant coefficients:

General solution to L.D.E. of n^{th} order with constant coefficients, rules for finding Complementary function., General method for finding Particular integral, P.I. of some standard functions, Method of Variation of Parameters, Cauchy's and Legendre's L.D.E., simultaneous linear differential equations .

Partial Diff. Equations:

Definition, formation of P.D.E., complete solution of PDE, Linear and non-linear PDE of types (i) f(p, q)= 0, (ii)f(p, q, z)= 0, (iii)f(p, q, x, y)= 0,(iv)f(p, q, x, y, z)= 0 ie Lagrange's form Pp+Qq=R and Clairaut's form z = px + qy + f(p, q), (v)Equations reducible to above forms. Complete solution of PDE of first and second order by method of separation of variables.

Vector Calculus:

Scalar and vector point functions, Differentiation of a vector function, Tangent and normal components of velocity and acceleration, orthogonal curves, Operator delta, Gradient of scalar point function& their physical meaning . Divergence and Curl of vector point function & their physical meaning. vector identities, solenoidal and conservative fields. Line integral, work done by force.

Functions of complex variables:

Analytic function, C-R equations(Cartesian & polar), Harmonic function, Milne Thompson method for finding analytic function, Conformal mappings, Bilinear transformation.

Text Books :

1. Text book of applied Mathematics, P.N.Wartikar and J.N.Wartikar, Pune Vidyarthi Griha, Pune, 2001.
2. .Higher Engineering Mathematics, B.S.Grewal, 6^{th} edition, Khanna publication, New Delhi, 1976.

Reference Books:

1. Advanced Engineering Mathematics, Kreyzig, 9^{th} edition, John Wiley & sons 1995.
2. Advanced Engineering Mathematics, John bird 5^{th} edition, Elsevier publication 2007.
3. Higher Engineering mathematics, C.R.Wiley, 8^{th} edition, John Wiley and sons 1999.

ETU301 NETWORK ANALYSIS

Teaching Scheme: 03L **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE Duration: 2Hrs. 30 min.

Basic analysis techniques and theorems: V-I relationship for inductance and capacitance, network graphs matrices associated with graphs, incidence, fundamental cut set and fundamental circuit matrices, Nodal analysis, mesh analysis, linearity and superposition theorem, source transformations - Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.

Two port networks: Characteristic impedance, propagation constant, image and iterative impedance, conversion between T and Π sections, two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters, inter relationships among parameter sets, reciprocity theorem, and inter-connection of two port networks: series, parallel and cascade

Filters and attenuators: Filters fundamentals, pass and stop band, constant K prototype-low pass filter, high pass filter, band pass filter, band stop filter, m-derived filters, composite filters.

Attenuators: Definition and units of attenuation, symmetrical T and Π attenuator, asymmetrical L section, T and Π attenuator, ladder attenuator.

Time domain analysis of circuits: Linear differential equations for series RC, parallel RC, series RL, parallel RL, series RLC, parallel RLC and coupled circuits, complete solution for step/impulse/sinusoid voltage/current inputs, natural response-transient response-time constant-rise and fall times-concept of d.c. steady state and sinusoidal steady state, frequency response of simple circuits from steady state solution, solution of two mesh circuits by differential equation method-determination of initial conditions.

Transformation of a circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance -impedance and admittance in the transform domain - node analysis and mesh analysis of the transformed circuit - nodal admittance matrix and mesh impedance matrix in the s-domain.

Sinusoidal steady state analysis and resonance : Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor relationships for R L C, impedance and admittance, condition for resonance, various properties of series resonance and anti resonance, figure of merit.

Text Book:

1. Network Analysis, M. E. Van Valkenburg, 3rd edition, Prentice Hall of India,1995.
2. Networks, Lines and Fields, John Ryder, 2nd edition, Prentice Hall of India, 1995.

Reference Books:

1. Circuits and Networks, Sudhakar and M. Shyam, 3rd edition,Tata McGraw-Hill, 2007.
2. Transmission Lines and Networks, Umesh Sinha, 1st edition, Satya Prakashan, New Delhi,1993.

ETU302 COMPONENTS, DEVICES AND INSTRUMENTS TECHNOLOGY

Teaching Scheme: 03L+01T **Total: 04** **Credits: 04**
Evaluation Scheme: 15 CT1 +15 CT1+ 10 TA + 60 ESE **Total Marks: 100**
ESE Duration: 2Hrs. 30 min.

Components: Resistors, capacitors, inductors, transformers - types, construction, specifications, applications and testing. Switches, relays, fuses, cables and connectors - types, construction, specifications, applications and testing. Heat sinks.

Formation of P-N junction: Alloying, diffusion, epitaxy and ion implantation, significance and formation of ohmic contact by welding (electric and ultrasonic welding) and thermo compression bonding, protection of p-n junction by oxidation and desiccants.

Integrated circuits fabrication and characteristic: Integrated circuit technology, basic monolithic integrated circuits, epitaxial growth, masking and etching, diffusion of impurities, transistors for monolithic circuits, monolithic diodes, integrated resistors, integrated capacitors and inductors, monolithic circuits layout, additional isolation methods large scale and medium scale integration (LSI and MSI), metal semiconductor contact.

Measurement and bridge measurement: Accuracy and precision, significant figures, types of errors, system of units, electric and magnetic units, international system of unit, electrical standards.

Kelvin bridge, AC bridges and their application, Maxwell bridge, Hay bridge, Schering bridge, unbalance conditions, Wien bridge, Wagner ground connection.

Measuring instruments: DC ammeters, DC voltmeter, series and shunt ohmmeter, multimeter, calibration of DC instruments, alternating-current indicating instruments, electrodynamometers in power measurements, watt-hour meter, power- factor meters, AC voltmeter using rectifiers, true rms-responding voltmeter, electronic multimeter, digital voltmeter, oscilloscopes - block diagram, operation, front panel, application.

Transducer: Classification of transducers, strain gages, displacement transducers, temperature measurements.

Text Books:

1. Modern Electronic Equipment, R. S. Khandpur, 1st edition, Tata Mc Graw Hill, 1999.
2. Electronic Instrumentation and Measurement Techniques, A. D. Helfrick and W. D. Cooper ,Eastern Economy Edition, PHI Learning Pvt. Ltd., New Delhi, 2008.

Reference Books:

1. Integrated Electronics, J. Millman, C. Halkias, 3rd edition, Tata McGraw Hill, 2006.

ETU303 ELECTRONIC DEVICES AND CIRCUITS

Teaching Scheme: 03L + 1T **Total: 04** **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE Duration: 2Hrs. 30 min.

Diode, special diodes and applications: Diode as a rectifiers (analysis of single phase rectifiers), analysis of C, L, LC and π- filter, small signal equivalent circuits of diodes, clipping and clamping circuits. Zener diode as a voltage regulator, opto-coupler. Schottkey diode, tunnel diode, varactor diode, PIN diode – construction, operation and applications.

Transistor characteristics and biasing: Overview of construction, working and V-I characteristics of BJT, methods of biasing- analysis and synthesis, d. c. load line, a. c. load line stability and stability factor.

FET-characteristics, biasing and modeling: Types, overview of construction, working and V-I characteristics of JFET and MOSFET, parameters, biasing, small signal model of JFET and MOSFET, CS and CD amplifiers.

Small signal low frequency BJT amplifier: Transistor hybrid model for CE, CB and CC configuration, determination of h-parameters from the characteristics, conversion formulas for the h-parameters of CE, CB and CC configuration, analysis of transistor amplifier circuit using h-parameter.

Study of Darlington emitter follower, bootstrap emitter follower, RC coupled amplifier, transformer coupled amplifier, direct coupled amplifier

Large signal amplifiers: Classification, analysis of class A, B, AB power amplifier – calculation of power gain, efficiency, power dissipation and distortion. Tuned amplifiers - single tuned, double tuned amplifiers.

Oscillators: Barkhausen criteria, RC oscillators - Wein bridge and phase shift, LC oscillators- hartley, colpitt's, clapp and crystal oscillators.

Text Books:

1. Electronic Devices and Circuits, J. Millman, C. Halkias and Satyabrata jit, 2nd edition, Tata McGraw Hill, 2008.
2. Electronic Devices and Circuits, D. R. Cheruku and B. T. Krushna, 2nd edition, Pearson Education, 2008.

Reference Books:.

1. Electronics Devices and Circuits Theory, R. Boylestad and L. Nashelsky, 9th edition, Prentice Hall India, 2007.
2. Electronic Principles, A. P. Malvino, 3rd edition, Tata Mc-Graw Hill, 1993.

ETU304 DIGITAL ELECTRONICS

Teaching Scheme: 03L **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA + 60 ESE **Total Marks: 100**
ESE Duration: 2Hrs. 30 min.

Number system and codes: Positional number system – Binary, octal, decimal, hexadecimal, general conversions, arithmetic operations on unsigned and signed numbers, 1's, 2's, 9's, 10's complement method, negative number representation, BCD codes, gray codes, ASCII codes, error detection and correction codes.
Boolean algebra and logic circuits: Logic gates – basic, derived and universal gates, theorems and properties of Boolean algebra, DeMorgan's theorem, canonical and standard SOP and POS forms, simplification and synthesis of Boolean functions using gates, Boolean theorems, K-Map ,don't care condition and Quine Mc Cluskey method (up to 4 variables).
Digital logic families: Characteristics of digital ICs, BJT and MOSFET as a switch, detailed analysis of TTL, CMOS logic family, study of RTL, DTL, ECL, I^2L logic families, tristate logic.
Combinational logic design: Arithmetic circuits as half and full adder and subtractor, 4-bit adder / subtractor, IC 7483, BCD adder, digital comparator, multiplexer, de-multiplexer, encoder, decoder.
Sequential logic design: One-bit memory cell, S-R, clocked S-R, J-K, master slave J-K, T-type, D-type flip-flops, shift registers, synchronous and asynchronous counters, up/down counters, ripple counters, MOD-n counters.
Semiconductor memories: RAM, ROM, PROM, EPROM, CCD and flash memories. Introduction to CPLD and FPGA.

Text Books:

1. Modern Digital Electronics, R.P. Jain, 3rd edition, Tata Mc-Graw Hill, 2005.
2. Digital Electronics-Circuits and Systems, V. K. Puri, 1st edition, Tata McGraw Hill Publications, 2003
3. Digital Principles and Application, A. P. Malvino, D. P. Leach, 6th edition, Tata Mc-Graw Hill, 2006.

Reference Books:

1. Digital Electronics, W. H. Gothman, 2nd edition, Prentice Hall India, 2006.
2. Digital Logic and Computer Design, M. Morris Mano, 3rd edition, Prentice Hall India Ltd, 2005.
3. Digital Principles and Design, D. Givone, 1st edition, Tata Mc-Graw Hill, 2002.

SHU305 GENERAL PROFICIENCY – II

Teaching Scheme: 01L+02P Total : 03 **Credit : 02**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

Presentation Skill:
Communication boosters – aura words, pronunciation, body language – voice, posture and gesture, eye contact, dress codes.
Function of culture code in presentation – planning, preparing and delivering a presentation, etiquettes, clarity and aliveness of delivery.
General communication skill for presentation – content matching and language matching for specific audience, tone, hummer poise- listener/speaker sensitivity.
Specific communication skill for presentation – icebreaker, small talk dialogue, debate, turn taking, effective and defensive handling of question.
Models of presentation – Public speaking, academic and professional presentation, group discussion, personal interview, technical report writing (IEEE standards).

Managerial skill:
Time management - advantages, time wasters – procrastination, time management tips and strategies.
Stress management- stress and its disadvantages, stress coping ability and stress inoculation training, management of various types of fear, depression and anger.
Conflict management -types of conflict, conflict stimulation and conflict resolution technique for conflict for effective conflict management, effective ways of dealing with people, significance of body language in communication and assertiveness training.
Interpersonal skills -concept of team, advantages of teamwork, promotion of team spirit, team building techniques, nurturing leadership qualities, negotiation skills.

Topics for assignments/practicals:
Minimum eight assignments/practicals based on above topics. The representative list is given below

1. Collection of new words concerning various technical and professional subjects
2. Listening of audiocassette or lecture or watching videocassette (based on the topics of managerial skill) followed by speech/seminar by students.
3. Listening of audiocassette or lecture or watching videocassette (based on the topics of managerial skill) followed by group discussion of students.
4. Collecting the information related to the topics of managerial skill using Internet, books, Magazines etc. and its power point presentation or seminar/lecture.
5. Power point presentation on topic related to any subject of programme.
6. Preparing a technical paper in IEEE format.

7. Management games.
8. Personal interview.
9. Extempore elocution, debate.

Note :

- **ICA** – The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.
- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.

ETU305 NETWORK ANALYSIS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU301. The list given below is just a guideline.

List:

1. To find self inductance of two coils, mutual inductance between the coils and coefficient of coupling.
2. To verify Maximum Power Transfer theorem.
3. To verify Compensation theorem.
4. To find Z parameters of two port networks.
5. To find Y parameters of two port networks.
6. To find transmission parameters of two port networks.
7. To study the response of RL series circuit to sinusoidal input and dc input.
8. To study the response of RC series circuit to sinusoidal input and dc input.
9. To design and implement constant 'K' of low pass filter.
10. To design and implement constant 'K' of high pass filter
11. To plot the frequency response of series resonance circuit.
12. To plot the frequency response of parallel resonance circuit.
13. To design and implement symmetrical / asymmetrical T-attenuator.
14. To design and implement symmetrical / asymmetrical π-attenuator.

Note :

- **ICA** – The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.
- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.

ETU306 COMPONENTS, DEVICES AND INSTRUMENTS TECHNOLOGY LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU302. The list given below is just a guideline.

List:

1. To study and calculate the values of resistor, capacitor, inductor.
2. To study different types of switches (SPDT, SPST, DPST, DPDT) and measure the value of resistance for open circuit and short circuit.
3. To study relays and measure the voltage.
4. Measurement of unknown resistance using Kelvin bridge.
5. Measurement of unknown capacitance using Schering bridge.
6. Measurement of unknown inductance using Hay bridge.
7. Measurement of weight using strain gauge load cell.
8. Measurement of force using strain gauge.
9. Measurement of displacement using LVDT.
10. Measurement of temperature using RTD.
11. Measurement of pressure using silicon pressure sensor.
12. Use of dc bridge for temperature measurement- Design and implementation..

Note :

- **ICA** – The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.
- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.

ETU307 ELECTRONIC DEVICES AND CIRCUITS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU303. The list given below is just a guideline.

List:

1. To design and implement voltage regulator using zener diode.
2. To draw V-.I characteristics of light emitting diode & observe LED as a switch**.**
3. To calculate ripple factor and PIV rating of half wave & full wave rectifier without filter.
4. To calculate ripple factor of half wave / full wave rectifier with C, LC-filters at resistive loads.
5. To calculate ripple factor of bridge rectifier with $\pi -$ filter at resistive loads.
6. To draw and observe the input and output characteristics of the transistor in common emitter configuration.
7. To understand operation of bipolar junction transistor as a amplifier.
8. To measure h-parameters of the transistor in common emitter configuration.
9. To observe the voltage divider biasing circuit operation of the transistor.
10. To determine the A_v, A_i and f_c of RC coupled amplifier.
11. To determine the A_v, A_i and f_c of Transformer coupled amplifier.
12. Measurement and study of output characteristics of JFET.
13. Measurement and study of output characteristics of MOSFET.

Note :

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- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.

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ETU308 DIGITAL ELECTRONICS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU304. The list given below is just a guideline.

List:

1. Study and verification of truth tables of basic and derived logic gates.
2. Implementation of basic and derived logic gates using only universal gates.
3. Design and implementation of adders and subtractors using logic gates.
4. Design and implementation of Binary-to-Excess-3 code converter.
5. Design and implementation of binary-to-gray / gray-to-binary decoder using logic gates.
6. Design and implementation of 4-bit binary adder/subtractor and BCD adder using IC 7483.
7. Design and implementation of 2-bit magnitude comparator using logic gates, 8-bit magnitude comparator using IC 7485.
8. Design and implementation of 16-bit odd/even parity checker/ generator using IC 74180.
9. Design and implementation of multiplexer and de-multiplexer using logic gates and study of IC 74150 and IC 74154.
10. Design and implementation of encoder and decoder using logic gates and study of IC 7445 and IC 74147.
11. Design and implementation of BCD to 7-segment decoder using logic gates.
12. Design and implementation of flip-flop circuit using logic gates.
13. Study and verification of truth tables of flip-flop ICs.
14. Construction and verification of 4-bit ripple counter and Mod-10/Mod-12 ripple counter.
15. Design and implementation of 3-bit synchronous up/down counter.
16. Implementation of SISO, SIPO, PISO and PIPO shift registers using flip-flops.

Note :

- **ICA** – The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.
- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.

SHU401 ENGINEERING MATHEMATICS-IV

Teaching Scheme: 03L **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA + 60 ESE **Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.

Complex integration: Line and contour integration, singular points, expansion of functions in Taylor's and Laurent's series, Cauchy's integral theorem and integral formula, residue theorem, evaluation of real integrals using residue theorem.
Vector spaces: Vector spaces and subspaces, null spaces, column spaces and linear transformations, linearly independent sets, bases, coordinate systems, dimensions of vector space, change of bases ,application to difference equations.
Orthogonality and least squares: Inner product, length and orthogonality, orthogonal sets, orthogonal projections, Gram-Schmidt process, least square problems, inner product spaces.
Probability: Introduction to random processes, probability distributions i.e. discrete and continuous distributions, probability density function, Binomial, Poisson, Normal distributions.

Text Books:

1. Text book of applied Mathematics, P. N. Wartikar, J. N. Wartikar, , Pune Vidyarthi Griha, Pune 2001.
2. Linear algebra and its applications, D. C. Lay, 3th edition, Addison Wesley, 2004.
3. Probability & Statistics for Engineers & Scientists, R. E. Walpole, R. H. Myers, S. L. Myers and Keying Ye, 7th edition, Pearson Education, 2005.

Reference Books:

1. Advanced Engineering Mathematics, John bird, 5th edition, Elsevier publication, 2007.
2. Advanced Engineering Mathematics, Kreyzig, 9th edition, John Wiley Publication, 1995.
3. Linear Algebra with applications, Nicolson, Mc Graw Hill, 2004.
4. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis, S Pillai, McGraw Hill, 2002.
5. Probability, Random Variables and Random Signal Principles, Peyton Z. Peebles, 2nd edition, McGraw Hill, 1987.

ETU401 SIGNALS AND SYSTEMS

Teaching Scheme: 03L+01T Total: 04 Credits: 04
Evaluation Scheme: 15 CT1 +15 CT1+ 10 TA + 60 ESE Total Marks: 100
ESE Duration: 2Hrs. 30 min.

Introduction to signals & system: Signals - continuous and discrete time signals, transformation in independent variable, exponential and sinusoidal signals, unit impulse and unit step functions. Systems - continuous & discrete time system, basic system properties: causality, stability, time invariance, linearity.

Linear time invariant system : Discrete time LTI system, continuous time LTI system, properties of LTI system - commutative, distributive, associative, LTI system with and without memory, inevitability, causality, stability, unit step response of LTI system, causal LTI system described by differential & difference equation, singularity function.

Fourier transform: The continuous time Fourier transform, Fourier transform for periodic signal, properties of continuous time Fourier transform, convolution property, multiplication properties.

The discrete time Fourier transform, Fourier transform for periodic signal, properties of discrete time Fourier transform, convolution properties, multiplication properties.

Sampling: The sampling theorem, reconstruction of a signal from its sample using interpolation the effect of under sampling: aliasing, discrete time processing of continuous time signals, sampling of discrete time signals.

Laplace transforms: The Laplace transform, region of convergence, inverse Laplace transform, properties of Laplace transform, analysis and characterization of LTI system, system function algebra and block diagram representation, unilateral Laplace transform.

Z-transforms: The Z-transform, region of convergence, inverse Z-transform, properties of Z-transform, analysis and characterization of LTI system, system function algebra and block diagram representation, unilateral Z-transform.

Text Books:

1. Signals & Systems, Oppenheim, 2nd edition, Prentice Hall of India, 1997.
2. Signals And Systems, S. Haykin, 2nd edition, John Wiley And Sons, 1999

Reference Book:

1. Signal Processing and Linear Systems, B P Lathi, 1st edition, Oxford Press, 1998.
2. Digital Signal Processing, S. Salivahanan, 2nd edition, TMH, 2005.

ETU402 ANALOG CIRCUITS

Teaching Scheme: 03L+01T **Total: 04** **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT1 + 10 TA + 60 ESE **Total Marks: 100**
ESE Duration: 2Hrs. 30 min.

Feedback amplifiers: The feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, input resistance, output resistance, method of analysis of a feedback amplifier, voltage series feedback, current series feedback, current shunt feedback, voltage shunt feedback.

The high frequency transistor: The high frequency T model, common- base short-circuit-current frequency response, alpha cut-off frequency, common-emitter short-circuit-current frequency response, hybrid pi (π) common-emitter transistor model, hybrid pi (π) conductance, hybrid pi (π) capacitances, validity of hybrid pi (π) model, variation of hybrid pi (π) parameters, CE short circuit current gain, current gain with resistive load, single stage transistor amplifier response with and without source resistance, gain- bandwidth product, emitter follower at high frequencies.

Frequency response of amplifiers: Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, bode plots, step response of an amplifier, bandpass of cascaded stages, RC coupled amplifier, low frequency of an RC coupled stage, effect of an emitter bypass capacitor on low frequency response, high frequency response of two cascaded CE transistor stages, multistage CE amplifier cascade at high frequencies, noise.

Multi-vibrators and sweep generators: Bistable multivibrators (BMV) - fixed bias, self bias, commutating capacitor, methods of improving resolution, symmetrical and unsymmetrical triggering, direct connected BMV, Schmitt trigger, emitter coupled BMV, monostable multivibrator (MMV) - collector coupled, emitter coupled MMV, triggering of MMV, astable multivibrator (AMV) - collector coupled, emitter coupled AMV. General features of a time base signal, exponential sweep circuit- UJT relaxation oscillator, transistor constant current sweep generator, miller and bootstrap sweep generator.

Differential amplifiers: Introduction, differential amplifier circuit configurations- DIBO- ac and dc analysis, DIUO, SIBO, SIUO, techniques to improve CMRR, biasing circuits-constant current sources, reference voltage sources, cascaded differential amplifier stages, level translator.

Text Books:

1. Integrated Electronics, Jacob Millman, Christos C. Halkias, 3rd edition, Tata McGraw Hill, 2006..
2. Pulse Digital and Switching Waveforms, Jacob Millman, Herbert Taub, Mothiki S Prakash Rao, 2nd edition, Tata McGraw Hill, 2007.

Reference Books:

1. Electronic Devices and Circuits, D. R. Cheruku and B. T. Krushna, 2nd edition, Pearson, 2008.
2. Op-Amps and Linear Integrated Circuits, Ramakant A. Gayakwad, 4th edition, Prentice Hall of India Learning, 2009.

ETU403 MICROPROCESSOR AND IT'S INTERFACING

Teaching Scheme: 03L **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA + 60 ESE **Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.

8085 Microprocessor architecture & microcomputer system: Block diagram and operation of microcomputer system, architecture and operation of 8085μP, pin diagram of 8085 μP.
8085 Instructions: Addressing modes, classification of 8085 μP instructions, instruction set, assembly language programming, counters and time delays, stack and subroutines, instruction timing diagrams.
Interfacing techniques: De-multiplexing of lower order address bus, generating control signals, memory organization, memory map, memory mapped I/O and I/O mapped I/O, address decoding techniques, interfacing of memory and I/O devices with 8085 μP.
I/O data transfer techniques: Interrupt system of 8085 μP, data transfer schemes, serial data transfer through SID and SOD lines, introduction to DMA data transfer scheme.
Microprocessor peripherals: Internal architecture, programming and interfacing with 8085 μP of 8255-Programmable Peripheral Interface, 8259-Priority Interrupt Controller, 8279-Programmable keyboard/display interface, 8237-Programmable DMA Controller, 8253-Progammable Interval Timer/Counter and 8251 USART.
Data conversion: Principle of data conversion- Analog-to-Digital and Digital-to-Analog, case study of ADC 0809 and DAC 0808, interfacing each with 8085 μP, application of ADC in temperature measurement etc.

Text Books:

1. Microprocessor, Architecture, Programming and Applications with 8085, Ramesh S. Gaonkar, 5th edition, Penram International Publication, 2004.
2. 8085 Microprocessor: Programming and Interfacing, N. K. Srinath, 1st edition, Prentice Hall India Ltd, 2005.

Reference Books:

1. 0000 to 8085 – Introduction to Microprocessor for Engineers and Scientists, P. R. Sridhar and P. K. Ghosh, 2nd edition, Prentice Hall India Ltd, 2005.
2. Introduction to Microprocessor, Aditya P. Mathur, 3rd edition, Tata McGraw-Hill, 2004.
3. Advanced Microprocessors and Peripherals, A. K. Ray and K. M. Bhurchandi, 2nd edition, Tata McGraw-Hill, 2008.

ETU404 CONTROL SYSTEM ENGINEERING

Teaching Scheme: 03L **Total: 03** **Credits: 03**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE **Total Marks: 100**
ESE Duration: 2 Hrs. 30 min.

Introduction to automatic control system: Open Loop and closed loop control system, servo mechanism, mathematical modeling of physical system, transfer function block diagram reduction technique, signal flow graph, effect of feed back on sensitivity and reduction of noise.

Control system components: DC servo motor, AC servo motor, AC tachometer, potentiometer, incremental encoder, absolute encoder, synchros, AC position control system, AC and DC control system, stepper motor.

Time response analysis: Standard test signals, time response of first-order systems, time response of second-order systems, steady-state errors and error constants, effect of adding a zero to a system, design specification of second-order systems, design consideration for higher-order systems, performance indices.

Stability of control system: The concept of stability, necessary condition for stability, Hurwitz stability criterion, Routh stability criterion, relative stability analysis, the root locus concepts, construction root loci, root contours, sensitivity of the roots of the characteristic equation.

Frequency response analysis and stability in frequency domain : Frequency domain specifications of the prototype second order system, correlation between time and frequency response, polar plots, Bode plots, all-pass and minimum-phase systems, Nyquist stability criterion, assessment of relative stability using Nyquist criterion, closed-loop frequency response, sensitivity analysis in frequency domain.

State variable analysis and design: Concepts of state, state variable and state model, state models for linear continuous-time systems, state variables and linear discrete-time systems, diagonalization, concept of controllability and observability,

Controller Study : Controller configurations-proportional, integral, derivative, PI, PD and PID controllers;.

Text Books:

1. Control System Engineering, I. J. Nagrath, l M. Gopal, 5th edition, Wiley Eastern, 2007.
2. Control System Theory and Application, Ghosh, 1st edition, Pearson Education, 2006.

References Books:

1. Modern Control Systems, K. Ogata, 4th edition, Prentice Hall of India, 2002.
2. Feedback Control System, C. L. Philips and R. D. Harbour, 4th edition, Prentice

Hall of India, 2000.

ETU405 OBJECT ORIENTED PROGRAMMING LAB

Teaching Scheme: 01L + 02P **Total: 03** **Credits: 02**
Evaluation Scheme: 50 ICA **Total Marks: 50**

Object oriented paradigm: Introduction to structured versus object oriented development, concept and advantages of OOP's, elements of OOP's – objects, classes, encapsulation, inheritance, polymorphism, basic, derived and user defined data type operators, control statements, structure of C++ programming.
Functions and classes: Class specification, class objects, class definition, public/private classes, member access, defining member functions, constructors and destructors, virtual and friend functions, function and operator overloading.
Inheritance and polymorphism: Defining derived classes, forms of inheritance, inheritance and member accessibility.
Applications: Applications in GUI design.
Minimum eight program shall be performed to cover above entire curriculum.

Text Books:

1. Object Oriented Programming with C++, E. Balagurusamy, 2nd edition, Tata McGraw Hill Publications, New Delhi, 2003.
2. Teach Yourself C++, Herbert Schildt, 3rd edition, Tata McGraw Hill, 2005.

Reference Books:

1. Mastering C++, K. R. Venugopal, 1st edition, Tata McGraw Hill, 2000.
2. Object Oriented Programming in C++, K. R. Shukla, 1st edition, Wiley India Pvt. Ltd, 2008.

Note :

- **ICA** – The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.

ETU406 SIGNALS AND SYSTEMS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU401. The list given below is just a guideline.

List:

1. Introduction to MATLAB.
2. To study signal processing toolbox.
3. To study system identification toolbox.
4. Write a program to plot the following functions: a) impulse function b) unit step c) unit ramp d) exponential e) sinusoidal
5. Study the aliasing effect by using a sinusoidal signal. Show the plots of continuous time.
6. Study sampled signal and reconstructed signals by using subplot.
7. Write a program to plot real, imaginary phase and magnitude of exponential function.
8. Write a program for pole-zero plot of Z-transform

Note :

- **ICA** – The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.
- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.

ETU407 ANALOG CIRCUITS LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU402. The list given below is just a guideline.

List:

1. Implement voltage shunt feedback amplifier and calculate various parameters
2. Simulate by using multisim, voltage-series, current-series and current-shunt feedback topologies and measure various parameters.
3. High frequency response of common emitter stage.
4. High frequency response of cascaded amplifier.
5. To study step response of amplifier and find out delay time and tilt.
6. To find out f_L and f_H from square wave testing of amplifier.
7. To measure voltage and current levels at stable state of BMV.
8. Design and implement MMV
9. Design and implement AMV.
10. Simulate by using multisim, BMV, MMV, AMV and compare their results with implemented one.
11. Implement Schmitt trigger and calculate LTP and UTP.
12. Design and implement UJT relaxation oscillator.
13. Design and implement any one constant current source.
14. Design and implement level shifting network.
15. Implement DIBO differential amplifier and measure its parameters.

Note :

- **ICA** – The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.
- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.

ETU408 MICROPROCESSOR AND IT'S INTERFACING LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments shall be performed to cover entire curriculum of course ETU403. The list given below is just a guideline.

List:

1. Write an assembly language program to subtract larger number from smaller number (8 bit) using 8085 and verify the result.
2. Write an assembly language program to add two 16 bit numbers using 8085 and verify the result.
3. Write an assembly language program to find greatest number among the series using 8085.
4. Write an assembly language program to arrange the numbers in descending order using 8085.
5. Write an assembly language program to find the sum of given numbers in an array.
6. Write an assembly language program and conversion subroutine to convert packed BCD number into equivalent binary number.
7. Write an assembly language program to perform memory to memory data transfer using 8085.
8. Write an assembly language program for arranging the array of numbers.
9. Write an assembly language program to perform multiple precision operations such as 24-bit addition, 16-bit complement etc.
10. Write an assembly language program to perform multiplication by shift & add method.
11. Interfacing of
    a. 8255 operations in various modes with some typical applications such as key-pad / LED bank
    b. ADC and DAC.
    c. Sine, square and triangular wave generator.

Note :

- **ICA** – The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.
- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.

ETU409 CONTROL SYSTEM ENGINEERING LAB

Teaching Scheme: 02P **Total: 02** **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
ESE Duration: 3Hrs.

Minimum eight experiments (Minimum six from group A and minimum two from group B) shall be performed to cover entire curriculum of course ETU404. The list given below is just a guideline.

List:

Group A:

1. To study potentiometer as error detector and find its transfer function.
2. To Study AC Servomotor and determine its transfer function.
3. To Study DC Servomotor and determine its transfer function.
4. To Study stepper motor and determine its transfer function.
5. To study and observe control process using PI controller.
6. To study and observe control process using PID controller.
7. To study synchros and obtain output verses input characteristics.
8. To study and observe response of RC first order system.
9. To study and observe response of RLC second order system.

Group B: (Software based experiment using MATLAB)

1. To determine transfer function into state space form and vice-versa.
2. To plot root locus diagram of an open loop transfer function and determine range of gain 'K' filter stability.
3. To plot bode diagram of an open loop transfer function.
4. To draw Nyquist plot of an open loop transfer function and examine the stability of the close loop system.

Note :

- **ICA** – The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.

- **ESE** – The End Semester Exam for practical shall be based on performance in one of the experiments and followed by sample questions.
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