GOVERNMENT COLLEGE OF ENGINNERING AMRAVATI

DEPARTMENT OF INSTRUMENTATION ENGINEERING

PROPOSED SCHEME FOR B.Tech. (Instrumentation Engineering)

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		
Sem III													
SHU303	Engineering Mathematics-III	3	0	---	3	10	15	15	60	---	---	100	3
INU 302	Electronic Devices and Circuits	3	1	---	4	10	15	15	60	---	---	100	4
INU303	**Numerical Methods**	**3**	**1**	**---**	**4**	**10**	**15**	**15**	**60**	**---**	**---**	**100**	**4**
INU304	Circuit Theory	3	---	---	3	10	15	15	60	---	---	100	3
INU305	Digital Electronics	3	---	---	3	10	15	15	60	---	---	100	3
INU306	Electronic Devices and Circuits Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU307	Circuit Theory Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU308	Digital Electronics Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU309	Computational Method Lab -I	---	---	2	2	---	---	---	---	50	--	50	1
SHU305	General Proficiency-II	1	--	2	3	--	--	--	--	25	25	50	2
Total		**16**	**2**	**10**	**28**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**
Sem IV													
SHU401	Engineering Mathematics-IV	3	-	---	3	10	15	15	60	---	---	100	3
INU402	Sensors and Transducer	3	1	---	4	10	15	15	60	---	---	100	4
INU403	Control System Component	3	1	---	4	10	15	15	60	---	---	100	4
INU404	Linear Integrated Circuits	3	--	---	3	10	15	15	60	---	---	100	3
EEU411	**Signals and Systems**	**3**	**1**	**---**	**4**	**10**	**15**	**15**	**60**	**---**	**---**	**100**	**4**
INU406	Sensors and Transducer Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU407	Control System Component Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU408	Linear Integrated Circuits Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU 409	Computational Method Lab -II	--	--	2	2	---	--	--	--	25	25	50	1
SHU403	Engg. Mathematics Lab	---	---	2	2	---	---	---	---	50	--	50	1
Total		**15**	**3**	**10**	**28**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**

Sem V													
INU501	Microprocessor Based Instrumentation	3	1	---	4	10	15	15	60	---	---	100	4
INU502	Chemical & Analytical Instrumentation	3	---	---	3	10	15	15	60	---	---	100	3
INU503	Digital Signal Processing	4		---	4	10	15	15	60	---	---	100	4
INU504	Electronic Instrumentation	3	---	---	3	10	15	15	60	---	---	100	3
INU505	Project Engineering & Management	3	---	---	3	10	15	15	60	---	---	100	3
INU506	Microprocessor Based Instrumentation Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU507	Chemical & Analytical Instrumentation Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU508	Electronic Instrumentation Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU509	Digital Signal Processing Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU510	Self Study-I	---	---	---	---	---	---	---	---	25	---	25	2
Total		**16**	**1**	**8**	**25**	**50**	**75**	**75**	**300**	**125**	**100**	**725**	**23**

• Interdisciplinary electives will be offered to students other than this department
• The self study I is based on INU501,INU502,INU503,INU504,INU505 class test each on the basis of 20% curriculum of the courses declared by the course coordinator at the beginning of semester
• One faculty member should be appointed as course coordinator for self study I & his/her teaching work load shall be considered one hour per week

Sem VI													
INU601	Microcontroller & It's Application	3	---	---	3	10	15	15	60	---	---	100	3
INU602	Power Electronics	3	---	---	3	10	15	15	60	---	---	100	3
INU603	Material Science & Process	3	---	---	3	10	15	15	60	---	---	100	3
INU604	Operation Research & Management	3	---	---	3	10	15	15	60	---	---	100	3
INU605	Feedback Control System	3	1	---	4	10	15	15	60	---	---	100	4
INU606	Microcontroller & It's Application Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU607	Power Electronics Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU608	Feedback Control System Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU609	Minor Project	---	---	2	2	---	---	---	---	25	25	50	2
INU610	Self Study-II	---	---	---	---	---	---	---	---	25	---	25	2
INU611	Industrial Lecture I	1	---	---	1	---	---	---	---	---	---	---	---
Total		**16**	**1**	**8**	**25**	**50**	**75**	**75**	**300**	**125**	**100**	**725**	**23**

• Interdisciplinary electives will be offered to students other than this department
• The self study II is based on INU601,INU602,INU603,INU604,INU605 class test each on the basis of 20% curriculum of the courses declared by the course coordinator at the beginning of semester
• One faculty member should be appointed as course coordinator for self study II & his/her teaching work load shall be considered one hour per week
• Credit shall be awarded on the basis of combined assessment of Industrial Lectures I & Industrial Lectures II

Sem VII													
INU701	Distributed Control System	3	---	---	3	10	15	15	60	---	---	100	3
INU702	Biomedical Engineering	3	---	---	3	10	15	15	60	---	---	100	3
INU703	Elective-I	3	---	---	3	10	15	15	60	---	---	100	3
INU704	Interdisciplinary Elective	3	---	---	3	10	15	15	60	---	---	100	3
INU705	Distributed Control System Lab	---	---	2	2					25	25	50	1
INU706	Biomedical Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU707	Elective-I Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU708	Project- I	---	---	4	4	---	---	---	---	50	---	50	2
INU709	Seminar	---	---	2	2	---	---	---	---	25	25	50	2
INU710	Industrial Training/ Visit	---	---	---	0	---	---	---	---	50	---	50	1
INU711	Industrial Lecture II	1	---	---	1	---	---	---	---	25	---	25	1
INU712	Self Study-III	---	---	---	0	---	---	---	---	25	---	25	2
Total		**13**	**0**	**12**	**25**	**40**	**60**	**60**	**240**	**250**	**100**	**750**	**23**

• Interdisciplinary electives will be offered to students other than this department
• The self study III is based on INU701,INU702,INU703,INU705 class test each on the basis of 20% curriculum of the courses declared by the course coordinator at the beginning of semester
• One faculty member should be appointed as course coordinator for self study III & his/her teaching work load shall be considered one hour per week
• Credit shall be awarded on the basis of combined assessment of Industrial Lectures I & Industrial Lectures II

Sem VIII													
INU801	Process Instrumentation & Control	3	1	---	4	10	15	15	60	---	---	100	4
INU802	Power Plant Instrumentation	3	1	---	4	10	15	15	60	---	---	100	4
INU803	Elective -II	3	---	---	3	10	15	15	60	---	---	100	3
INU804	Elective-III	3	---	---	3	10	15	15	60	---	---	100	3
INU805	Process Instrumentation & Control Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU806	Elective-II Lab	---	---	2	2	---	---	---	---	25	25	50	1
INU807	Project-II	---	---	6	6	---	---	---	---	75	100	175	5
INU808	Self Study-IV	---	---	---	---	---	---	---	---	25	---	25	2
Total		**12**	**2**	**10**	**24**	**40**	**60**	**60**	**240**	**150**	**150**	**700**	**23**

• Interdisciplinary electives will be offered to students other than this department
• The self study IV is based on INU801,INU802,INU803,INU804 class test each on the basis of 20% curriculum of the courses declared by the course coordinator at the beginning of semester
• One faculty member should be appointed as course coordinator for self study IV & his/her teaching work load shall be considered one hour per week
 # For project there will be 8 students in each batch (two groups of 4 students)
*** 1 hour working load to coordinate for coordination**

Electives

IN723	IN724	IN823	IN824

A) Instrumentation System Design	A) Distributed Control System	A) Opto- Electronics Instrumentation	A) Image processing
B) Instrumentation for Agriculture &food processing	B)Sensors& Transducer	B) Neural etwork and Fuzzy logic control	B) Adaptive Control
C) Biomedical Signal & Processing	C) Biomedical Instrumentation	C) Advance Sensors	C) System Identification
D) Embedded Systems	D) Process Instrumentation	D) Digital Control System	D) Nonlinear Control System

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 and their physical meaning . Divergence and Curl of vector point function and 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 and 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 and 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

INU302 ELECTRONIC DEVICES AND CIRCUITS

Teaching Scheme : 03 L+1T **Total : 04** **Credit : 04**

Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**

Duration of ESE : 2hrs 30min.

Semiconductor Diode: Diode as rectifiers, filter circuits, voltage multiplier, clipping circuits, clamping circuits, peak detector, differentiator, and integrator circuits, Zener diode as a voltage regulator, tunnel diode.

Bipolar Junction Transistor: Transistor characteristics, Transistor amplifier characteristics, transistor biasing, thermal stability, thermal runway Amplifier configurations and comparison, Hybrid model h- parameters. Low frequency response of transistor amplifier, introduction to high frequency response of transistor amplifier, multistage amplifier, amplifier noise and distortion amplifier concept computation creation, two stage RC Coupled amplifier, high input resistance transistor circuit.

Large signal amplifiers: Class A, B, AB, and C operations and their performance characteristics, push pull, complimentary symmetry amplifier.

Feedback amplifiers: Feedback concept, transfer gain, general characteristics of negative feedback amplifier, methods of feedback and their effects.

Oscillators: Sinusoidal oscillator, resonant circuit, phase shift oscillator, wein bridge oscillator, crystal oscillator and frequency stability, collpitts oscillator, Hartley oscillator. Transistor switch multivibrators of different types, Schmitt trigger.

Introduction to Unipolar Devices: Ideal M/S diode, Si-SiO2 MOS diode, MOSFET, MOSFET structures, Basic device characteristics, FET, Comparison of BJT and FET amplifier.

Text Books:

1. Integrated Electronics, Analog and Digital Circuits and Systems, Millman J.and Halkias C. C, 27th Edition, McGraw Hill, 1972
2. Electronics Principles, Malvino A.P, 6th Edition, Tata McGraw Hill New Delhi, 2001.

Reference Books:

1. Electronic Devices and Circuit Theory, Boylestad and Nishelsky, 9th Edition, Prentice Hall of India, 2005
2. Electronics Devices, T. Floyd, 6th edition, Pearson.

INU303 NUMERICAL METHODS

Teaching Scheme : 03 L+01T Total : 04 **Credit : 04**

Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**

Duration of ESE : 2hrs 30min.

Introduction to MATLAB

Computer Arithmetic: Floating Point representation, Arithmetic operations with normalized floating point numbers, errors in numbers, Truncation error, round-off error, inherent error, absolute and relative error.

Solution of Non linear Equations: Bisection method, false position method, Newton-Raphson method, Method of successive approximation, rate of convergence.

Interpolation: Lagrange's interpolation, difference table, Newton's Interpolation, iterated linear interpolation technique.

Solution of simultaneous algebraic equations: Gauss elimination method, Iterative methods and their convergence. III conditions equation, Gauass seidal method.

Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Romberg integration, Newton's cote's integration formula, error in these formulae.

Solution of Ordinary differential equation: Taylor series method, Picard's method, Euler method, Range-Kutta method second and fourth order, predictor corrector method.

Numerical solution of partial differential equation: Finite difference, approximation to derivatives. Laplace equation, iterative methods for the solution of equations.

Least square approximation of functions: Linear regression, Polynomial regression, fitting exponential and trigonometric functions.

Linear Programming: Introduction, General linear programming problem, graphical method, canonical and standard form of L.P.F., simplex method, Duality concept.

Text Books:

1. Numerical Methods for Engineers, Steven C. Chapra and Raymond P. Canal, 4th edition, Tata McGraw-Hill, 2005
2. Numerical Methods, S. R. K. Iyengar, R. K. Jain**,** New Age International, 2009

Reference Books:

1. Numerical Methods, 7/e By Faires and Burden Thomson Learning 2000
2. Introductory methods of numerical analysis, S. S. Sastry, 4th edition, Prentice Hall of India, 2004
3. Computer oriented Numerical Method, V. Rajaraman, Prentice hall of India,
4. Numerical Methods, Faires and Burden, 7th edition, Thomson Learning, 2000

INU304 CIRCUIT THEORY

Teaching Scheme : 03 L Total : 03 Credit : 03

Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100

Duration of ESE : 2hrs 30min.

B**asic Circuit elements and Waveforms:** Introduction, Circuit Components, Assumptions or Circuit Analysis, Basic Definitions, Conservation of Energy, Source of Electrical Energy, Standard Input Signals, Sinusoidal Signal.

Conventions for describing Networks: Reference Directions for Current and Voltage, Active Element Conventions, The Dot Convention for Coupled Circuits, Topological Description of Networks

Mesh and Node Analysis: Introduction, Kirchhoff's Laws, Source Transformation, Mesh and Node Analysis, Network Equations for RLC Network, Magnetic Coupling.

Network Theorems: Introduction, Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem(Statement of above Theorems, their explanation, Steps for solving a network utilizing above theorems), Applications in AC Circuits: Thevenin's and Norton's Theorems, Superposition Theorem for AC Networks, Maximum Power Transfer Theorem for AC Networks

Sinusoidal Steady State Circuit Analysis: Introduction, element responses, Phasors, Impedance and Admittance, Voltage and Current Division in the frequency domain, The mesh Current Method, The Node Current Method, Thevenin's and Norton's Theorem, Superposition of AC Sources.

Laplace Transformation and its Application in Circuit Analysis: Network solution, Laplace Transformation technique.

Network Functions, Poles and Zeros: Network functions for one port and two port network, calculation of network functions: Ladder network, General network. Poles and zeros of network functions, restriction on poles and zeros locations for driving point functions and transfer functions, Time domain behavior from pole and zero plot.

Two-Port Parameters: Relationship of two-port variables, short-circuit Admittance Parameters, the open circuit Impedance parameters, Transmission parameters, The hybrid parameters, Relationships between parameter sets, Parallel connection of two-port networks.

Textbooks:

1. Network Analysis, Van Valkenberg M.E., 3rd Edition, Prentice Hall India New Delhi, 1996
2. Engineering Circuit Analysis, Hayt and Kemmerly, 7th Edition, Tata McGraw Hill, 2007

Reference Books:

1. Electric Circuits: Schaum's Outline Series, Edminister J.A., 2nd Edition, McGraw- hill,1988
2. Basic Circuit Theory, Huelsman L.P., 3rd Edition, Prentice Hall India New Delhi, 2002
3. Circuit Theory :Continuous and discrete Time System Element network synthesis, C.P. Kouriokose, Prentice Hall India, New Delhi, 2005
4. Circuit Theory (Analysis and Synthesis), A. Chakravarti, 1st edition, New Age International Publishers, 1998

INU305 DIGITAL ELECTRONICS

Teaching Scheme : 03 L Total : 03 Credit : 03

Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100

Duration of ESE : 2hrs 30min.

Number system and codes: Binary, octal, hexadecimal. Arithmetic operations: Addition, Subtraction, multiplication, division in Binary, octal and hexadecimal.

Weighted/non-weighted codes, alphanumeric codes, Binary Coded Decimal, Gray codes, Hamming codes, parity codes, Cyclic Redundancy Code method.

Combinational logic design: Switching algebra, combinational circuit analysis, combinational circuit synthesis, and combinational circuit minimization, K-Map of three, four, five variable functions, minimizing SOP and POS expressions. Quine McClusky minimization, design of encoders, decoders, tri-state devices, multiplexers, demultiplexers, comparators, arithmetic circuits– half and full adders, ripple adders, subtractors, carry look ahead adders, combinational multipliers, examples- barrel shifter, floating point encoder etc.

Sequential logic design: Latches and flip flops, edge triggered and master slave flip flops (SR, JK, D, T etc), feedback sequential circuit design, sequential PLDs,

Counters and shift registers, synchronous design methodology, clock skew, gating the clock, asynchronous inputs.

A/D and D/A Converters: Single slope, dual slope tracking and successive approximation type, Introduction to flash A/D converter, comparison of commercial IC's and Criteria for judging the performance. Binary weighted resister type D/A converter, R-2-R ladder type D/A converter.

Semiconductor memories: RAM cell, ROM, PROM, EPROM, EEPROM, CCD Memories, introduction to CPLD and FPGA.

Logic families: DTL, RTL, ECL, IIL, TTL, MOS/ CMOS, comparison of TTL and CMOS characteristics, interfacing techniques. Display LED/LCD, interfacing.

Text Books:

1. Modern Digital Electronics, Jain R.P., 6th Edition, Tata McGraw Hill, 2006
2. Digital Principles and Applications, Malvino A. P., Leach D. R. , Tata McGraw Hill, 2003

Reference Books:

1. Digital Design, Morris M. Mano, 4th Edition, Tata McGraw Hill, 2006
2. An Engineering Approach to Digital Design, Fletcher W. I. ,Prentice Hall of India, New Delhi,1997
3. Digital design- Principles and Practices, Wakerly J. F. , 4th Edition, P H International /Pearson India, 2005
4. Digital Circuits and Logic Design, Samuel C. Lee, Prentice Hall of India, New Delhi,1976

INU306 ELECTRONIC DEVICES AND CIRCUITS LAB

Teaching Scheme : 02 P Total : 02 Credit: 01

Evaluation Scheme: 25 ICA + 25 ESE Total Marks: 50

Duration of ESE : 3 hrs.

Minimum Eight Experiments to be performed covering the Entire Syllabus of INU302 Electronic Devices and Circuit.

Representative list is as follows.

1. Input and output characteristics of transistor in CB and CE configuration.
2. Calculation of H parameters for a CE amplifier.
3. Design and construction of R-C phase shift oscillator.
4. Drain characteristics of FET.
5. Performance of transistor series regulator.
6. Performance measures of Zener shunts regulator.
7. Testing of Hartley / Colpits oscillator.
8. Assembly study and testing of RC coupled amp. (Freq. response)
9. Determination frequency response of transformer coupled amplifier.
10. Design and testing of crystal oscillator.
11. Design of emitter follower amplifier.

12. Soldering and disordering of electronic components and design, assembly of simple transistor amplifier and testing for gain, frequency response.

Note-1 : Verify all above Practical's using Electronics component simulator software.

Note -2

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.

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

INU307 CIRCUIT THEORY LAB

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

Minimum Eight Experiments to be performed covering the Entire Syllabus of INU304 Circuit Theory.

Representative list is as follows.

1. Kirchhoff's law justification.
2. Maximum power transfer theorem practical justification.
3. Thevenin's theorem practical justification.
4. Norton's theorem practical justification.
5. Plotting of behavior of RC circuit for step input.
6. Plotting of behavior of RL circuit for step input.
7. Plotting of behavior of RLC circuit for step input.
8. Plotting of behavior of RLC circuits for ramp input.
9. Fourier series analysis of square wave.
10. Fourier series analysis of triangular wave.
11. To determine the hybrid and impedance parameters of a given network.
12. To determine frequency response of lo pass, Hi pass, band pass RLC filter.

Note :

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.

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

INU308 DIGITAL ELECTRONICS LAB

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

Minimum Eight Experiments to be performed covering the Entire Syllabus of INU305 Digital Electronics.

Representative list is as follows.

1. Verification of truth table for logic gates
2. Performance NAND / NOR gate as universal gate.
3. Design and performance Half /Full adder subtractor.
4. Design and performance of Code converter.
5. Design and performance of Multiplexer / demultiplexer.
6. Flip-flops design using logic gates
7. Design of Shift registers
8. Design of Down counter
9. Study of A/D Converter
10. Study of D /A converter
11. Design of Asynchronous decade counter
12. Performance of RAM and EPROM.
13. Performance of LED / LCD display.
14. Performance of RAM and EPROM.

Note :

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.

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

INU309 COMPUTATIONAL METHOD LAB-I

Teaching Scheme : 02 P Total : 02 **Credit: 01**
Evaluation Scheme: 50 ICA **Total Marks: 50**

Minimum Eight Program to be performed using MATLAB covering the entire syllabus of INU303 (Numerical Methods)

1. Basic MATLAB Programming(mathematical operations, Matrix operations)
2. Solution of nonlinear equations using bisection method.
3. Solution of nonlinear equations using Newton-Raphson Method.
4. Solution of simultaneous algebraic equation using Gauss elimination method.

5. Solution of simultaneous algebraic equation using iterative method
6. Numeric integration using trapezoidal rule.
7. Numerical integration using Sampson's rule.
8. Numerical integration using Romberg Integration.
9. Linear programming.
10. Least square approximation function.

Text Books:

1. MATLAB programming for Engineers, Stephan J. Chapman, 2nd Edition, Pearson Education, 2004

Reference Books:

1. Numerical Methods Using MATLAB, Mathews. J. H. and Fink K.D., 4th Edition, PHI New Delhi, 2005.
2. Mastering MATLAB-7, Hanselman and Littlefield, Prentice Hall, 2005.
3. MATLAB and It's applications in Engineering, R. K. Bansal, A. K. Goel, and M. K. Sharma, Pearsons Educations India, 2009.
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers; Rudra Pratap, Oxford University Press, 2010.

Through this course students are expected to learn the following topics in MATLAB and Programming .

1. Introduction to MATLAB
2. MATLAB Basics
3. Programming in MATLAB
4. User defined functions

Note:

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.

SHU305 GENERAL PROFICIENCY–II

Teaching Scheme : 01 L+02 P Total : 03 **Credit: 02**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**
Duration of ESE : 3 hrs.

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 – ice breaker, 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 team work, promotion of team spirit, team building techniques, nurturing leadership qualities, negotiation skills.

Topics for assignments / practical:

Minimum eight assignments / practical based on above topics. The representative list is given below

1. Collection of new words concerning various technical and professional subjects
2. Listening of audio cassette or lecture or watching video cassette (based on the topics of managerial skill) followed ; speech/seminar ; students.
3. Listening of audio cassette or lecture or watching video cassette (based on the topics of managerial skill) followed ; 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 program.
6. Preparing a technical paper in IEEE format.
7. Management games.
8. Personal interview.
9. Extempore elocution, debate.

Text Books:

1. Professional Communication Skills, Alok Jain, Pravin S., R. Bhatia, A. M. Sheikh, S. Chand and Company New Delhi, 2005
2. Personality Development, E. B. Hurlock, 5th Edition, Tata Ma Graw Hill, New Delhi, 2006

Reference Books :

1. Power of Positive Thinking, D. J. Mile,1st Edition, 28th reprint , Rohan Book Company, Delhi, 2004
2. All About Self motivation, Pravesh Kumar, 3rd Edition, Goodwill Publishing House, New Delhi, 2005
3. Body Language: How to Read Others Thoughts ; their Gestures; Pease, Allan, 3rd Edition, Sudha Publications, New Delhi, 1998

4. Multiple Intelligences: The Theory in Practice: A Reader: Gardner, Howard, 1st Edition, Basic Books, New York, 1993
5. Six Thinking Hats, De Bono, Edward, 2nd Edition, Penguin Books, New York, 2000

Note :

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.

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

SHU401 ENGINEERING MATHEMATICS - IV

Teaching Scheme: 03 L Total : 03 Credits: 03

Marking Scheme : 15CT1 + 15CT2 + 10TA + 60 ESE Total Marks: 100

Duration of ESE : 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 and J. N. Wartikar, Pune Vidyarthi Griha, Pune 2001.
2. Linear algebra and its applications, D. C. Lay, 3th edition, Addison Wesley, 2004.
3. Probability and Statistics for Engineers and 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 application; 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.

INU402 SENSORS AND TRANSDUCERS

Teaching Scheme : 03 L+01 T Total : 04 **Credit : 04**

Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**

Duration of ESE : 2hrs 30min.

Mechanical Measurement:

Definition and Concept: Transducer, Sensor, Calibration, Classification: Active, passive, primary, secondary, mechanical, electrical, electronic, analog and digital transducers. Selection criteria, Static and Dynamic characteristics

Displacement Measurement - Working principles, types, measuring circuits and applications of:

Resistive transducers, Inductive transducers, Capacitive transducers, Piezoelectric transducers, Ultrasonic transducers and Hall effect transducers, Optical transducers, Encoders, Photoelectric pickups, stroboscope. Accelerometers -Eddy current type, piezoelectric type, Seismic type. Jerk meter. Force and weight: Basic methods of force measurement, elastic force traducers, strain gauge, load cells, shear web, piezoelectric force transducers, vibrating wire force transducers, Torque: Strain gages, feedback torque sensors.

Process measurement:

Temperature Measurement - Working principles, types, measuring circuits, compensation circuits and applications of : Thermometers, RTD, Thermistors, Thermocouples,

Semiconductor temperature sensors: Diode and IC temp sensors. Ultrasonic temp detector, quartz crystal temp, detector.

Radiation: Pyrometers (Total and Radiation), Infrared sensors. Fiber optic thermometer**.**

Flow: Bernoulli's theorem, Reynolds Number. Differential pressure type flow sensors: Orifice and their types, Venturi and Nozzle. Pressure taps Pitot tube, annubar. Variable area meter (Rotameter). Turbine type flow meter, Electromagnetic flow type, ultrasonic flow meter, Vortex shedding type, mass flow meters, anemometers, flow tantalizers and solid flow measurement.

Pressure Measurement - Working principles, types, measuring circuits and applications of: Pressure scale, Manometers, Elastic pressure sensors, Secondary pressure sensors. Differential pressure measurements. High-pressure sensors: Dead weight tester, Bulk modulus cell, Bridge man type (Pressure sensitive wires).Vacuum sensors: McLeod gauge, thermal conductivity (Pirani, Thermocouple gage) ionization types,

Level: Float displacers, bubbler, and DP- cell Ultrasonic, capacitive, radar, resistance, Solid level detectors, and fiber optic level detectors.

Miscellaneous Measurements: pH, Conductivity, Humidity, moisture and sound measurement.

Text Books:

1. Electrical ,Electronic Instrumentation and Measurement, Sawhney A. K., 8th Edition, Dhanapat Rai and Sons, 1995
2. Instrumentation Devices and Systems, Rangan, Mani, Sharma, 9th edition, Tata McGraw Hill, Delhi, 1997

3. Sensors and Transducer, Patranabis , 2nd Edition, Prentice Hall India Pvt. Ltd., 2004

Reference Books:

1. Principle of industrial Instrumentation, Patranabis D., 2nd Edition, Tata McGraw Hill, Delhi, 1997
2. Instrumentation and Measurement Principles, Murthi D.V.S, 3rd Edition, Prentice Hall of India, New Delhi, 1995
3. Instrumentation Measurements and Analysis, Nakra B.C. and Choudhari K.K., Tata McGraw Hill Co Ltd. New Delhi,2001
4. Process Measurement and Analysis, Liptak Volume-I Chilton Book Co. 2001
5. Vendor Catalogues for various physical parameters like pressure, temperature, flow and level.

INU403 CONTROL SYSTEM COMPONENTS

Teaching Scheme : 03 L+01T Total : 04 **Credit : 04**

Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**

Duration of ESE : 2hrs 30min.

Non-Electrical system components:

Mechanical components: Introduction to mechanical Network, spring-mass-dash pot and absorbers, mechanical equalizer and their transfer function, comparison of electrical mechanical systems**,** flyweight tachometer, gyroscope, and principal of its operations, equation of motion of gyroscope practical gyroscope, application of gyroscope.

Hydraulic components: introduction to basic types of hydraulic transmission lines, servo motors, power supply, Hydraulic circuits and transmission, applications like motor speed control, reciprocating, loading, unloading, sequencing of cylinders and direction control.

Pneumatic components: Pneumatic power supplies, introduction to pneumatic systems and their analysis, filters and pressure regulators, flapper nozzle system, pneumatic motors. Pneumatic Power Cylinder.

Control valves: Classification and Types of valves. Valve actuators and accessories, detail study of valve characteristics. Study of valve construction; considering examples from hydraulic, pneumatic and electrical types. Introduction to valve selection criteria and specifications. Valve sizing with mathematical treatment. Numerical for different fluids should be solved.

Electrical System Components:

Synchros: transmitter and receiver construction, principal, analysis and applications of Synchros as an error detector.

AC and DC servomotors: Constructional features, theory of operations, transfer function and block diagram, load-torque, speed-torque characteristics, electronic drive circuits, comparative studies and applications in control system.

Stepper motor: construction, types such as variable reluctance stepper motor, single stack and multi stack, permanent magnet stepper motor, hybrid steeper motors and their principle of operations, drive circuits and high speed operations, applications in control systems.

Relays: ON/OFF Valves, Solenoid Valves**.**

Text Books:

1. Control System Component, Desai M., 1st Edition, PHI Publication, 2010.
2. Control system Engg., Nagrath I. J., Gopal M., 5th Edition, New Age Intern.(P) Ltd.

Reference Books:

1. Control Valve Handbook, Philip L. Skousen, Tata McGraw –Hill, 2004
2. Hydraulic system, P. Mujumdar, Tata McGraw –Hill
3. Vendor catalogues for various control system components like pressure regulator, Tachometer, different control valves, relays .
4. Modern Control Technology : Components & Systems, Christopher T. Kilioan, 3rd edition, Delmar/Thompson Learning, 2005
5. Automatic Control Systems & Components, James R. Carstens, 2nd edition, Prentice Hall International, 1990

INU404 LINEAR INTEGRATED CIRCUITS

Teaching Scheme : 03 L Total 03 **Credit : 03**

Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**

Duration of ESE: 2hrs 30min.

Integrated circuits: An over view of IC design technology, introduction to wafer cleaning, photolithography, Ion implantation. Classification of IC families and their comparison.

Operational Amplifiers Fundamentals: Characteristics of Op Amp, Noise figure, Types of Noise, Causes of Slew Rate, Frequency response, Frequency / Phase Compensation Techniques. SR, CMRR, PSRR/SVRR. Offset adjustment techniques, Comparative study of different amplifier ICs such as LM 741, LM 324,OP 07.

Feedback amplifiers. Positive and negative feedback amplifiers, voltage series feedback amplifier, Voltage shunt feedback amplifier and differential amplifier configuration and their special cases with applications.

Linear and Nonlinear applications of op amp: Voltage Summing with averager, Voltage subtractor, Current booster, Integrator and practical integrator, Differentiator and practical differentiator, Instrumentation Amplifier with three op-amp and its disadvantage of low CMRR. Current to voltage and voltage to current converter, Equation solving using opamp.

Comparator characteristics, ZCD and its use, Schmitt trigger with external bias, window detector. Precision half wave and full wave rectifiers with IC 741.

Timers and Voltage regulators: Timers: Triggerable and retriggerable, IC 555 monostable multivibrators and astable multivibrators. Designs and Applications.

Voltage regulators : Linear and Switching DC Voltage regulators: Basic 78XX and 79XX voltage regulators, voltage regulator IC723.

Active filters and oscillators: Frequency response of op-amp, Butterworth approximation of low pass, high pass, band pass, band reject, Notch filter, all pass, first order and second order filters, Introduction of chebyshev filter,

Sinusoidal oscillators using Op amp: Barkhausen criteria, Wein Bridge oscillator, RC phase shift oscillator.

Study of some important IC's: IC 8038 function generator IC, PLL IC's 565 and its applications. The VI7660 voltage inverter and its applications.

Text Books:

1. Op-amp and Integrated circuits, Ramakant A. Gaikwad, 3rd Edition, PHI Publication, 2002
2. Integrated Circuits, K.R. Botkar, 9th Edition , Khanna Publisher, 2003

Reference Books:

1. Design with Op-amp and Analog Integrated circuits, Sergio Franco, Tata McGraw Hill Edition, New Delhi, 1998
2. Analog Electronics, L. K. Maheshwari and M.M.S. Anand, Prentice Hall of India, New Delhi.
3. Physics of Semiconductor Devices, S. M. Sze, 5th edition, John Wiley Publications.

EEU411 SIGNALS AND SYSTEMS

Teaching Scheme : 03 L +01T Total : 04 Credit: 04

Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100

Duration of ESE : 2 Hrs.30 min.

Introduction to Signals and Systems, System Properties, Convolution of Signals, Linear Shift Invariant Systems and their Properties.

Introduction to Transforms, Fourier series and Fourier Transform, Convergence of Fourier Transform, Properties of Fourier Transform.

Sampling Theorem, Sampling/Reconstruction of Signals, Realistic Sampling, Aliasing, Introduction to Digital Signal Processing, Discrete Time Fourier Transform and Properties.

Introduction to Laplace Transform and Z-Transform, Region of Convergence, Properties of Laplace and Z Transform, Inverse Laplace and Z Transforms, Rational System Functions.

Text Books:

1. Signals And System, S. Haykin, 2nd Edition, John Wiley And Sons, 1999
2. Analog And Digital Signal Processing , Ambardar A., Thomson Learning, 2005

Reference Books:

1. Signals and systems, Oppenheim and Schafer, 2nd Edition ,Prentice Hall India Of India, 1997
2. Signal and System: Analysis using, Transform Method and Matlab by M. J. Roberts, 2nd Edition, McGraw Hill company Ltd. 2003.
3. http://www.nptel.iitm.ac.in/
4. www.ocw.mit.edu

INU406 SENSORS AND TRANSDUCERS LAB

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

Minimum Eight Experiments to be performed covering the Entire Syllabus of INU402 Sensors and Transducers.

Representative list is as follows.

1. Calibration of Displacement measurement system. (Strain Gauges and LVDT).
2. Calibration of Speed measurement system. (Photoelectric and Tachometer).
3. Calibration of Temperature measurement system. (Thermocouple and RTD).
4. Calibration of Flow measurement system. (Orifice, Venturi and Rotameter).
5. Calibration of Pressure Gauges using Dead Weight Tester.
6. Differential pressure measurement using manometer/differential pressure transmitter.
7. Pressure measurement using bourdon tube/bellows/diaphragm/strain gauge.
8. Calibration of Level measurement system. (Capacitive, Bubbler Methods)
9. Study of pH measurement.

Note:

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.

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

INU407 CONTROL SYSTEM COMPONENTS LAB

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

Minimum Eight Experiments to be performed covering the Entire Syllabus of INU403 Control system component

Representative list is as follows.

1. Study of syncro characteristics:
   a) Study of syncro transmitter characteristics.
   b) Study of syncro transmitter and receiver pair.
2. Study of stepper motor:
   a) Study of stepper motor and translator.
   b) Open loop control system with digital input.
   c) Open loop control system with analog input.

3. Study of a. c. servo motor:
   a) Control characteristics of servo motor, amplitude control (control voltage vs. speed characteristics)
   b) Speed torque characteristics.
4. Study of Power Cylinder.
5. Study of hydraulic control valve.
6. Study of pneumatic control valves and their characteristics.
7. Study of Filter and Pressure Regulator
8. Study of flapper nozzle system.
9. Study of different Hydraulic Components
10. Study of Pneumatic Components

Note :

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.

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

INU408 LINEAR INTEGRATED CIRCUITS LAB

Teaching Scheme: 02 P Total : 02 Credit : 01

Evaluation Scheme: 25 ICA+ 25 ESE Total Marks: 50

Duration of ESE : 3 hrs.

Minimum Eight Experiments to be performed covering the Entire Syllabus of INU405 Linear Integrated Circuit

Representative list is as follows.

1. Measurement of op-amp parameters and comparison with op-amp data sheets.
2. Assembling of op-amp Inverting, Non inverting and differential circuits to measure an input in the range of mill volts to few volts.
3. Design and signal conditioning circuits using RTD and thermister with an instrumentation amplifier to read a temperature of water bath and calibration.
4. Design of signal conditioning circuit to operate a relay or to generate timing delays (e.g.10 sec., or 20 or 20 sec. or 1 minute) using IC 555.
5. Design of a circuit to work as a current source using IC 78xx.
6. Design of a circuit to work as voltage regulator of 10 or 20 volts using IC 723. Precision rectifier to rectify few volts as input.
7. Use of 565 PLL as a frequency multiplier.
8. Design of Oscillators using op-amp. and testing.
9. Design of single stage differential amplifier and testing.
10. Design of low and high pass filters with a cut off frequency of 1 kHz or 2 kHz and testing for frequency response.
11. Design of instrumentation amplifier using 3 op-amps and testing for gain, frequency response.

12. Design of cascade amplifier system using op-amp and testing for gain and frequency response.
13. Design of attenuator circuit using amplifier and testing for gain.
14. Testing of faulty analog instrument and finding faults.
15. Design of band pass filter using op-amp and testing for frequency response.

Note :

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.

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

INU409 COMPUTATIONAL METHOD LAB-II

Teaching Scheme: 02 P Total : 02 Credit : 01

Evaluation Scheme: 25 ICA+ 25 ESE Total Marks: 50

Duration of ESE : 3 hrs.

Minimum Eight Program to be performed covering the Entire Syllabus of EEU411 Signal and Systems and INU303 Numerical Methods

1. Solution of Ordinary Differential Equations using MATLAB
2. Solution of Linear Differential Equations using MATLAB
3. Solution of Quadratic Equations using MATLAB
4. Write a MATLAB code to plot all the basic signals in CT and DT (sine, cosine, step, impulse, signum, sinc, exponential, ramp etc.)
5. Write a MATLAB code to compute simple signal processing operations. (sum, product, difference, scaling, time shifting).
6. Write a MATLAB code to compute and plot the output of the LTI system using convolution in CT and DT.
7. Write a MATLAB code to plot magnitude and phase spectra of sequences using DFT and verify the properties of DFT.
8. Write a MATLAB code to evaluate Z-Transform for causal, finite/infinite sequences and plot pole-zero representation of any LTI systems.
9. Write a MATLAB code to solve linear-difference equation and second-order linear differential equation with its pole-zero representation.

The course coordinator should explain the methods/algorithms to solve the problem and the students should write the program and submit the same.

Note :

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.

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

SHU403 ENGINEERING MATHEMATICS LAB

Teaching Scheme: 02P **Total: 02** **Credit : 01**
Evaluation Scheme: 50 ICA **Total Marks: 50**
Duration of ESE : 3 hrs.

Minimum five experiments shall be performed from the list given below. The experiments to be carried shall cover entire curriculum and the list is just a guideline.

List :

To be conducted with the help of MATLAB/ Mapple (Engineering Application).

1. Getting started with (inbuilt demonstrations and help MATLAB/Mapple
2. Matrix operations, Solution of linear equations, Eigen values and Eigen vectors.
3. Differentiation, integration of a single variable function.
4. Solution of Linear differential equation.
5. Solution of system of nonlinear equation (example: Newton Raphson, Secant, etc).
6. Plotting of graphs like bar, pie, line etc with given set of data or of given equations.
7. Infinite series expansion (example: Sine, Cosine, etc).
8. Fourier series and Fourier transform.
9. Probability.
10. Statistics.

Note:

ICA – The Internal Continuous Assessment shall be based on the practical record and knowledge/skill acquired. The performance shall be assessed experiment wise by using continuous assessment formats, A and B.