B.Tech Instrumentation Engineering Syllabus Structure and Details
(July 2020 onwards)

Course No.	Course Name	L	T	P	C	Course No.	Course Name	L	T	P	C
Semester I						**Semester II**					
UPH101	Engineering Physics	3	1	0	8	UCH201	Engineering Chemistry	3	1	0	8
UMA101	Engineering Mathematics-I	3	1	0	8	UMA201	Engineering Mathematics-II	3	1	0	8
UEE101	Basic Electrical Engineering	3	1	0	8	UCSE201	Programming for Problem Solving	4	1	0	10
UHSS101	English Communication	2	0	0	4	UCE201	Engineering Drawing and Computer Graphics	1	0	0	2
UME101	Engineering Workshop	1	0	0	2	UHSS201	Professional Ethics and Human Value	2	0	0	4
UPH171	Engineering Physics Lab	0	0	3	3	UCH271	Engineering Chemistry Lab	0	0	2	2
UEE171	Basic Electrical Engineering Lab	0	0	2	2	UCSE271	Programming for Problem Solving Lab	0	0	3	3
UHSS171	English Communication Practice	0	0	2	2	UCE271	Engineering Drawing and Computer Graphics Lab	0	0	4	4
UME171	Workshop Practice	0	0	4	4						
Contact Hours: 26		**12**	**3**	**11**	**41**	**Contact Hours: 26**		**13**	**3**	**10**	**41**
Semester III						**Semester IV**					
UMA301	MATHEMATICS-III	3	1	0	8	UMA401	NUMERICAL METHODS	3	0	0	6
UPH301	APPLIED PHYSICS	2	0	0	4	UEE401	ELECTRICAL MACHINES	3	0	0	6
UIE301	NETWORK THEORY	3	1	0	8	UIE401	ANALOG INTEGRATED CIRCUITS	3	0	0	6
UIE302	ELECTRONIC DEVICES & CIRCUITS	3	0	0	6	UIE402	SENSORS AND TRANSDUCERS	3	0	0	6
UIE303	ELECTRICAL & ELECTRONIC MEASUREMENTS	3	0	0	6	UIE403	DIGITAL ELECTRONICS	3	1	0	8
UIE304	FUNDAMENTALS OF INSTRUMENTATION	3	0	0	6	UMA471	NUMERICAL METHODS LAB	0	0	2	2
UIE371	NETWORK THEORY LAB	0	0	2	2	UEE471	ELECTRICAL MACHINES LAB	0	0	2	2
UIE372	ELECTRONIC DEVICES & CIRCUITS LAB	0	0	2	2	UIE471	ANALOG INTEGRATED CIRCUITS LAB	0	0	2	2
UIE373	ELECTRICAL & ELECTRONIC MEASUREMENTS LAB	0	0	2	2	UIE472	SENSORS AND TRANSDUCERS LAB	0	0	2	2
						UIE473	DIGITAL ELECTRONICS LAB	0	0	2	2
Contact Hours: 28		**17**	**2**	**6**	**44**	**Total Contact Hours 22**		**15**	**1**	**10**	**42**
Semester V						**Semester VI**					
UCSE504	DATA STRUCTURE & ALGORITHM	3	0	0	6	UHSS601	ENGINEERING ECONOMICS	3	0	0	6
UIE501	MICROPROCESSOR & MICROCONTROLLER	3	1	0	8	UIE611	POWER ELECTRONICS	3	0	0	6
UIE502	CONTROL SYSTEMS	3	0	0	6	UIE612	COMMUNICTION ENGG.	3	0	0	6
UIE503	INDUSTRIAL INSTRUMENTATION	3	0	0	6	UIE601	PROCESS CONTROL	3	0	0	6
UIE511	DIGITAL SIGNAL PROCESSING	3	0	0	6	UIE602	ELECTRONIC INSTRUMENTATION	3	0	0	6
UIE571	MICROPROCESSOR & MICROCONTROLLER LAB	0	0	2	2	UIE603	OPTICAL FIBER & OPTOELECTRONICS	3	0	0	6
UIE572	CONTROL SYSTEMS LAB	0	0	2	2	UIE671	POWER ELECTRONICS LAB	0	0	2	2
UIE573	INDUSTRIAL INSTRUMENTATION LAB	0	0	2	2	UIE672	PROCESS CONTROL LAB	0	0	2	2
UIE574	DIGITAL SIGNAL PROCESSING LAB	0	0	2	2	UIE673	ELECTRONIC INSTRUMENTATION LAB	0	0	2	2
Total Contact Hours 23		**15**	**1**	**8**	**40**	**Total Contact Hours 22**		**18**	**0**	**6**	**42**
Semester VII						**Semester VIII**					
UHSS701	ENTERPRENEURSHIP & SKILL DEVELOPMENT	3	0	0	6	UIE811	VIRTUAL INSTRUMENTATION	3	0	0	6
UIE711	ANALYTICAL INSTRUMENTATION	3	0	0	6	UIE812/UIE813	ELECTIVE 1*	3	0	0	6
UIE712	BIOMEDICAL INSTRUMENTATION	3	0	0	6	UIE815/UIE816	ELECTIVE 2**	3	0	0	6
UIE713	EMBEDDED SYSTEMS	3	0	0	6	UIE891	MAJOR PROJECT	0	0	12	12
UIE791	INDUSTRIAL TRAINING	0	0	3	3						
UIE792	SEMINAR	0	0	3	3						
UIE793	MINOR PROJECT	0	0	7	7						
Total Contact Hours: 28		**15**	**0**	**13**	**37**	**Total Contact Hours: 21**		**9**	**0**	**12**	**30**
Total Mandatory Credits: 317											

B. Tech Instrumentation Engineering Syllabus Details

Semester I

Paper code: UPH101
Paper name: Engineering Physics **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

1. **Mathematical Physics:**
   Vector and Scalar field, grad, divergence, curl, Laplacian, line integral, surface integral, volume integral, physical examples in the context of electricity and magnetism, Stokes theorem, Gauss theorem (No proof). [5]

2. **Electrodynamics:**
   Gauss Law of electrostatics, Biot-Savart Law, Ampere's Law, Displacement current, Equation of Continuity, Maxwell's equations in differential and integral form, Maxwell's wave equation in free space, propagation of EM wave in free space, transverse nature of EM wave. [6]

3. **Heat and thermodynamics**:
   Thermodynamic system and state variables, Heat &Work, Zeroth Law, 1^{st} and 2^{nd} laws of thermodynamics, Isothermal and adiabatic changes, Carnot theorem, Carnot engine, entropy, pyrometer. [5]

4. **Wave and Oscillations:**
   - Transverse wave on a string, reflection and transmission of waves at boundary, impedance matching, standing waves and their eigen frequencies, acoustics waves and speed of sound.
   - Simple harmonic motion**,** Damped oscillation-its differential equation, energy decay in a damped oscillation, Forced vibration, Resonance, Sharpness of resonance and quality factor. [8]

5. **Introduction to Quantum Mechanics:**
   Wave-Particle duality, Black body radiation, Photoelectric effect, Compton effect, Uncertainty principle, wave function, the Schrodinger time dependent and time independent equations, application of Schrodinger equation for free particle in one dimensional infinite potential box. [6]

6. **Optics and Optoelectronics:**
   - Huygens' Principle, superposition of waves and interference of light, Young's double slit experiment, Newton's rings, Diffraction, Single slit diffraction, grating.
   - LASER: Einstein's theory of matter radiation interaction and A and B coefficients, amplification of light by population inversion, properties of laser: monochromaticity, coherence, directionality and brightness, different types of laser: gas lasers (He-Ne) and solid state laser (Ruby), applications of laser in science, engineering and medicine.
   - Light emitting diodes (LED): device structure, materials, characteristics and figures of merit. [10]

Books / References:

1. *Engineering Physics, Malik and Singh, Tata Mc Graw Hill*
2. *Engineering Physics, Naidu, Pearson*
3. *Engineering Physics, Gupta & Gaur, Dhanpat Rai*
4. *Quantum Mechanics, Ajay Ghatak S. Lokanathan, Trinity*
5. *Quantum Mechanics: A Text Book for undergraduates, Mahesh C Jain, TMH*
6. *Thermodynamics and kinetic theory of gases*, W. Pauli, Dover Publications, 2010
7. *Electromagnetic Theory, Prabir K. Basu & Hrishikesh Dhasmana, AneBooks*
8. *Introduction to Electrodynamics*, *David Griffiths*
9. *Electricity*, *magnetism and light*, *W. Saslow*
10. *Oscillations and waves in physics*, *Ian G. Main*,
11. *The physics of vibrations and waves*, *H.J. Pain*,
12. *Arthur Beiser*, *Concepts of Modern Physics (Sixth Edition)*, *Tata McGraw-Hill Publication*, *New Delhi (1988).*

Paper Name: Engineering Physics Lab **Credit: 3**
Paper code: UPH171 **L-T-P: 0-0-3**

List of experiments:

Experiment No 1: To determine the magnetic moment of a bar magnet and the horizontal component of the earth's magnetic field.

Experiment No 2: To study the Hall Effect in semiconductor (Germanium Crystal) and then to calculate the Hall coefficient.

Experiment No 3: To Verify Stefan-Boltzmann law of thermal radiation by electrical method.

Experiment No 4: To determine the coefficient of thermal conductivity of a bad conductor (glass) by using Lee's Disc apparatus.

Experiment No 5: To study the variation of time period of a bar pendulum about different axes and determine the value of acceleration due to gravity (g) at the place.

Experiment No 6: To determine the wavelength of sodium light by measuring the diameters of Newton's Rings.

Experiment No 7: To determine the wavelength of Laser light by using diffraction grating.

Experiment No 8: To determine the grating element by using sodium vapour lamp.

Experiment No 9: To determine the value of Planck's constant with the help of vacuum phototube.

Experiment No 10: To study the current flowing through an external circuit by a potentiometer and determine the internal resistance of a standard cell.

Paper code: UMA101
Paper name: Engineering Mathematics-I **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

Module 1: Calculus-I **(15hours)**

Successive derivative, Libnitz's Theorem, Tangentand Normal, Derivation of arc length (Cartesian and Polar coordinates), curvature, partial derivatives, homogeneous functions. Expansions of functions using Taylor's theorem

Beta and Gamma functions and their properties,applications of definite integrals.

Module 2: Sequences and Series **(10 hours)**

Convergence of sequence and series, tests for convergence (Comparison test, Ratio test,Cauchy's Root test),Fourier series, Change of intervals, Half range sine and cosine series.

Module 3: Multivariable Calculus **(15 hours)**

Differentiation of vector functions, scalar and vector filed, gradient of a scalar function, directional derivatives,divergence, curl and their properties, integration of vector functions, line, surface and volume integral, Green's, Gauss's and Stoke's Theorems.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics

Paper code: UHSS101
Paper name: ENGLISH COMMUNICATION **Credit: 4**
Total contact hours:39 **L-T-P: 2-0-0**

Module 1: Vocabulary Building: 1.1 Word Formation 1.2 Root words from foreign languages and their use in English 1.3 Understanding prefixes and suffixes to form derivatives 1.4 Antonyms and Synonyms, Functional Vocabulary, Idioms and Phrasal Verbs	**Contact hours: 3**
Module 2: Basic Writing Skills 1.1 Sentence Structure 1.2 use of phrases and clauses in sentences 1.3 Importance of proper punctuation 1.4 Creating Coherence 1.5 Organizing Principles of paragraph in documents	**Contact hours: 4**

1.6 technicques of writing precisely	
Module 3: Identifying Common Errors in Writing 1.1 Subject-verb Agreement 1.2 Noun-pronoun agreement 1.3 Effective Principles of Sentence Structure 1.4 Misplaced Modifiers 1.5 Articles 1.6 Prepositions 1.7 Redundancies 1.8 Cliches	**Contact hours: 4**
Module 4: Nature and Style of Sensible Writing 1.1 Describing 1.2 Defining 1.3 Classifying 1.4 Providing examples or evidence 1.5 Writing Introduction and Conclusio	**Contact hours: 4**
Module 5: Business Writing 1.5 Letter Writing, Memo, Report 1.6 Email 1.7 CV, Resume	**Contact hours: 4**
Module 6: Oral Communication (The Unit involves interactive practice sessions in language Lab) 6.1 IPA Symbols, pronunciation, Intonation, Stress and Rhythm 6.2 Listening Comprehension 6.3 Common Everyday Situations: Conversation and dialogues 6.4 Communication at work place 6.5 Interviews 6.6 Formal Presentations	**Contact hours: 4**
Module 7: Learning Language through Literature 7.1 Novel: R.K. Narayan *The Guide* 7.2 Poem: John Keats *Ode to a Nightingale* and *Ode to a Gracian Urn*	**Contact hours: 4**

BOOKS RECOMMENDED:

(1) Practical English Usage, Michael Swan, OUP,1995
(2) Remedial English Grammar, F.T. Wood, Macmillan, 2007
(3) On Writing Well, William Zinsser, Harper Resource Book, 2001
(4) Study Writing, Liz Hamp-Lyons and Ben Heasely, CUP, 2006
(5) Communication Skills, Sanjay Kumar and PushpLata, OUP, 2011
(6) Exercises in Spoken English, Parts-I-III, CIEFL, Hyderabad, OUP

Paper code: UHSS171;
Paper name: English Communication Practice **Credit: 2**
Total contact hours: 40 **L-T-P-C: 0-0-2-2**

Module 1Listening Practices 1.1 Enhancing listening skills 1.2 Different types of listening 1.3 How to be a good listener 1.4 Barriers to Effective Listening	**Contact hours: 3**
Module 2: Speaking Skills 2.1 The sounds of English 2.2 Benefits of Speaking 2.3 Self Development through Speaking Skills	**Contact hours: 4**
Module 3: Reading Skills 3.1 Definition 3.2 Kinds of reading 3.3 Critical Reading Practices 3.4 Reading Method 3.5 Reading Speed Skimming Scanning Active Reading	**Contact hours: 4**
Module 4: Writing Skills 4.1 Purpose 4.2 Importance of Style 4.3 Essay 4.4 Business Writing	Contact hours: 4
Module 5: Remedial English Grammar 5.1 Tense 5.2 Subject Verb agreement 5.3 Relative Clauses 5.4 Prepositions 5.5 Understanding voice changes	

BOOKS and Software RECOMMENDED:

(1) Practical English Usage, Michael Swan, OUP,1995
(2) Remedial English Grammar, F.T. Wood, Macmillan, 2007
(3) On Writing Well, William Zinsser, Harper Resource Book, 2001
(4) Study Writing, Liz Hamp-Lyons and Ben Heasely, CUP, 2006
(5) Communication Skills, Sanjay Kumar and PushpLata, OUP, 2011
(6) Exercises in Spoken English, Parts-I-III, CIEFL, Hyderabad, OUP
(7) Study Skills in English, Michael J.Wallace, CUP]
(8) Sky Pronunciation
(9) Tense Buster
(10) Business Writing

Paper code: UME101
Paper name: Engineering Workshop **Credits: 2**
Total contact hours: 12 **L-T-P: 1-0-0**

Module 1: Carpentry shop (2 hrs)

i. Introduction with the shop
ii. Various structure of wood and types of wood
iii. Different types of tools, machine and accessories used in Carpentry shop
iv. Safety Precautions in workshop

Module 2: Fitting Shop (2 hrs)

i. Introduction with the fitting shop
ii. Various marking, measuring, cutting, holding and striking tools
iii. Different Operations like chipping, filing, marking drilling etc.
iv. Working principle of drilling machine, lapping dies etc.

Module 3: Welding Shop (2 hrs)

i. Introduction
ii. Types of Welding, Arc Welding, Gas Welding, Gas Cutting
iii. Welding of dissimilar materials, selection of welding rod material, size of rod and work piece
iv. 3 Different types of flames
v. Elementary symbolic Representation
vi. Safety and precautions

Module 4: Machine Shop (2 hrs)

i. Introduction
ii. Study of Different types of Lathe machine, shaping machine, Drilling machine
iii. Study of Different types of hand tools and machine tools and parts
iv. Safety & precautions

Module 5 :Turning shop (2 hrs)

i. Introduction
ii. Various marking, measuring, cutting, holding, and string tools
iii. Working principle of Drilling machine, tapping, dies, its uses
iv. Safety precautions

Module 6: Electrical Shop (2 hrs)

i. Introduction
ii. Various terms and instruments used in electrical wiring
iii. Study of different tools used in simple house wiring
iv. Difference between ac and dc line

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
(ii) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
(iii) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Paper code: UME171

Paper name: Workshop Practice **Credits: 4**

Total contact hours: 36 **L-T-P: 0-0-4**

Module 1: Carpentry shop (6 hrs)

Demo of different wood working tools and machines
Demo of different wood working processes
Simple joints like T joints, Cross halving joint, dovetail joint etc.
One simple utility job.

Module 2: Fitting Shop (6 hrs)

Demo of different fitting tools and machines and power tools
Demo of different processes in fitting shop
Squaring of a rectangular metal piece
Making a V-block of metal piece
One simple utility job.

Module 3: Welding Shop (6 hrs)

Demo of different welding tools and machines
Demo of Arc Welding, Gas Welding, Gas Cutter and rebuilding of broken parts with welding
Any one Composite job involving lap joint welding process.

Module 4: Machine Shop (6 hrs)

Demo of different machines and their operations
Preferably prepare a simple job (e.g Turning operation etc)

Module 5 Turning shop (6 hrs)

Demo of lathe machine, drilling machine
One job related to plane and taper turning , threading and knurling
One job related to drilling and tapping

Module 6 Electrical Shop (6 hrs)

Demo of simple house wiring and use of tools
One job related to simple house wiring
Fittings of cut outs, fuses and other simple fittings etc.
Difference between Single phase wiring and three phase wiring

Paper code: UEE101
Paper name: Basic Electrical Engineering **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

Module 1: Contact hours: 2
Introduction: Sources of energy; General structure of electrical power systems, Power transmission and distribution via overhead lines and underground cables.

Module 2: Contact hours: 6
DC circuits: Definitions of active, passive, linear, non-linear circuits elements and networks, Kirchoff's laws, Nodal and mesh analysis, voltage and current sources, network theoremssuperposition. Thevenin's, Norton's, maximum power transfer, millman's, and reciprocity
theorems, analysis of simple circuits with DC excitation.

Module 3: Contact hours: 8
Single phase AC circuits: generation of single phase sinusoidal EMF, instantaneous, average and effective value, form and peak factor, examples of other alternating waveforms and average and effective value calculations, concept of phasor and phasor diagrams, lagging and leading of phasors, pure resistive, inductive and capacitive circuits, power factor, complex power, R-L, R-C and R-L-C series circuits, parallel AC circuits, series and parallel resonance.

Module 4: Contact hours: 4
Three phase AC circuits: Generation of three phase EMF, delta and star connections, line and phase value of emf and current, solutions of simple 3-phase balance circuits with resistive and inductive loads, 3-phase power, comparison between 3-phase and 1-phase systems, applications of 3-phase systems.

Module 5: Contact hours: 5
Magnetic circuits: Ampere's circuital law, B-H curve, definition of mmf, flux, flux-density and reluctance, comparison between electric and magnetic circuits, series, parallel and series-parallel circuits and their solutions, energy stored in magnetic circuit, lifting magnets, electromagnetic induction, self and mutual inductance, hysteresis and eddy current losses.

Module 6: Contact hours: 5
Electrical machines: Introduction of electrical machines, classifications (DC and AC machines), transformers, technical specifications, reading of nameplate data, general applications (especially 1-phase and 3-phae induction motors).

Module 7: Contact hours: 5
Electrical measuring instruments: Classification of instruments, essentials of indicating type instruments – deflecting torque, controlling torque, damping, types of indicating instruments, MC and MI type ammeters and voltmeters, extension of range, use of shunts and multiplier, errors and compensation.

Module 8: Contact hours: 5
Electrical installations: Electrical wiring and type, fuse and its ratings, types of wires and cables, LT switch gears: MCB, ELCB, MCCB etc. Earthing and its importance. Electrochemical power sources: primary and secondary cells, classifications of secondary cells based on applications, Lead-acid cell, electrical characteristics of lead-acid cell, maintenance, charging methods of batteries.

Books / References:

(i) D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
(ii) D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
(iii) B.L. Thereja, A.K. Thereja, “ A Textbook of Electrical Technology”, S.Chand

Paper code: UEE171
Paper name: Basic Electrical Engineering Lab **Credit: 2**
Total contact hours: 18 **L-T-P: 0-0-2**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, rheostat and wattmeter.
2. Make a measured resistance from a given rheostat
3. Verification of Kirchhoff’s laws
4. Verification of Superposition theorem
5. Verification of Thevenin’s theorem
6. Verification of Maximum Power Transfer theorem
7. Measurement of voltage, current, power and power factor in single phase AC circuits.
8. Measurement of lamp’s filament resistance.
9. Wiring

Semester II

Paper code: UCH201
Paper name: Engineering Chemistry **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

UNIT:1 Molecular Structure and Quantum Mechanics: Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.Molecular orbital and quantum mechanics: Schrodinger equation, Eigen function, orthogonal and orthonormal. (6L)

UNIT:2 Electrochemistry: Electrochemical Cells – EMF of a cell, Electrodes, reference electrodes, application of Nernst equation and related problems. Principle of fuel cell, lead acid battery. Corrosion and material oxidation (4L)

UNIT:3 Reaction dynamics and Thermodynamics: Reaction laws: rate and order; molecularity; first and second order kinetics; (Arrhenious equation) catalysis. Laws and applications of thermodynamics, 1st law and 2nd law, Carnot cycle and related problems.
(8L)

UNIT:4 Instrumental Methods of Analysis: Introduction to sophisticated instrumental techniques for characterization of compounds, materials, metals such as Powder X-ray diffraction, surface area, IR, UV,-Vis, NMR, SEM, TEM and GCMS (3L)

UNIT:5 Structure, Reactivity of Organic Molecules and Synthesis of Drug Molecule: Concept of electron displacement and their applications, types of intermediate organic species, brief study of some addition, elimination and substitution reaction, cyclization and ring openings. Benzyne reaction, Chichibabin reaction, Hoffman Exhaustive reactions, few important name reactions, to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule. (5L)

UNIT:6 Polymerization: Concepts, classifications and industrial applications; polymerization processes, degree of polymerization (addition and condensation polymerization); preparation, structure and use of some common polymers: plastic (PE, PP, PVC, Bakelite), rubber (natural rubber, SBR, NBR), fibre (nylon 6,6; polyester); conducting and semiconducting polymers.
(4L)

UNIT:7 Industrial Chemistry: Solid liquid and gaseous fuels; constituents of coal, carbonization of coal, coal analysis, proximate and ultimate analysis, classification of coal, petroleum, gasoline. Octane number, cetane number, aviation fuel, natural gas, water gas.
(4L)

UNIT:8 Materials Engineering: Concept of nano-chemistry, new forms of carbon, S.W.C.N.T., M.W.C.N.T., Liquid crystals. (4L)

UNIT:9 Biochemistry: Carbohydrates, lipids, amino acids, proteins, Nucleic acid– DNA and RNA, Vitamins and hormones – sources and application. (2L)

Paper name: Engineering Chemistry Lab **Credit: 2**
Paper code: UCH271 **L-T-P: 0-0-2**

Experiment-1: Aim of the experiment:*To determine the coefficient of viscosity of the glycerol by using Ostwald's viscometer*.

Experiment-2: Aim of the experiment:*To determine the surface tension of the given liquid with respect to water at room temperature by using Stalagnometer*.

Experiment-3: Aim of the experiment:*To identify acid radicals be dry and wet tests.*

Experiment-4 Aim of the experiment:*To identify basic radicals be dry and wet tests*

Experiment-5 Aim of the experiment:*Preparation of standard solution of Na_2CO_3*

Experiment-6 Aim of the experiment:*Preparation of standard solution of oxalic acid.*

Experiment-7 Aim of the experiment:*Determination of strength of H_2SO_4 by titrating with 0.1 N Na_2CO_3*

Experiment-8 Aim of the experiment:*Determination of strength of NaOH by titrating with 0.1 N HCL*

Experiment-9 Aim of the experiment:*Redox Titration $KMnO_4$ Vs $H_2C_2O_4$*

Experiment-10 Aim of the experiment:*Introduction to sophisticated instruments like FT-IR, UV-Visible and GC*

Text/Reference Books:

1. S. Chawla, *A Text Book of Engineering Chemistry*, Dhanpat Rai Publishing Co.
2. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Co.
3. Atkins, *Physical Chemistry*, Oxford.
4. J. D. Lee, *Concise Inorganic Chemistry*, Blackwell Science.
5. V.R. Gowariker, N.V. Viswanathan, J. Sreedhar, *Polymer Science*, New Age International Publisher.
6. A.K. Chandra, *Introductory Quantum Chemistry*, 4th Edition, McGraw-Hill
7. S.K. Ghosh Advanced General Organic Chemistry (A Modern Approach) (Set I & Ii) NCBA Publisher, New Delhi, 2009
8. B. Viswanathan, P. S. Raghavan, Practical Physical Chemistry, Viva
9. Dr. S. Rattan, Experiments in Applied Chemistry, S. K. Kataria& Sons.

Paper code: UMA201
Paper name: Engineering Mathematics-II **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

Module –1: Matrices **(10 hours)**

Inverse and rank of a matrix,rank-nullity theorem, System of linear equations, Symmetric, skewsymmetric and orthogonal matrices, Determinants, Eigenvalues and eigenvectors, diagonalisation of matrices,Cayley-Hamilton Theorem.

Module-2: **First order ordinary differential equations** **(10 hours)**

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree,equations solvable for p, equations solvable for x and y, and Clairaut'sform.

Module -3:Ordinary differential equations of higher orders **(8 hours)**

Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation,System of linear differential equations.

Module -4: **Probability and Statistics** **(12 hours)**

Probability spaces, conditional probability, independence; Discrete and continuous random variables and their properties, Independent random variables; Expectation of Discrete and continuous random variables, Moments, mean and variance.

Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions.

Reference /Text Books

1. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,

2008.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

7. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
8. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
9. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
10. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
11. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
12. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.

Paper code: UCSE201
Paper name: Programming for Problem Solving **Credit: 10**
Total contact hours: 75 **L-T-P: 4-1-0**

Module 1: Introduction to Programming **Contact hours: 10**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm. Flowchart/ Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Module 2: Arithmetic expressions and precedence **Contact hours: 7**

Module 3: Conditional Branching and Loops **Contact hours: 8**

Writing and evaluation of conditionals and consequent branching
Iteration and loops

Module 4: Arrays **Contact hours: 7**

Arrays (1-D, 2-D), Integer arrays and Strings

Module 5: Basic Algorithms **Contact hours: 8**

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Module 6: Function **Contact hours: 8**

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Module 7: Recursion **Contact hours: 5**

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Module 8: Structure **Contact hours: 6**

Structures, Defining structures and Array of Structures

Module 9: Pointers **Contact hours: 8**

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Module 10: File handling **Contact hours: 8**

Books / References:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Paper code: UCSE271
Paper name: Programming for Problem Solving Lab **Credit: 3**
Total contact hours: 45 **L-T-P: 0-0-3**

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8 and 9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

Paper code: UCE201
Paper name: Engineering Drawing and Computer Graphics **Credit: 2**
Total contact hours: 12 **L-T-P: 1-0-0**

Module 1: Theory of Lettering and Plane Curves **Contact hours: 2**

Essentials of lettering, Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Module 2: Theory of Projection of Points, Lines and Plane Surfaces Contact hours: 2

Introduction to orthographic projection - principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module 3: Theory of Projection of Solids **Contact hours: 2**

Introduction to the concepts and description of methods of drawing projections of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

Module 4: Theory of Projection of Sectioned Solids and Development of Surfaces
Contact hours: 2

Introduction to the concepts and description of sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

Module 5: Theory of Isometric and perspective projections **Contact hours: 2**

Principles of isometric projection – Introduction to the concepts and description of isometric scale – Isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones-combination of two solid objects in simple vertical positions – Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Module 6: Basics of AutoCAD **Contact hours: 2**

Introduction to AutoCAD, Basics of AutoCAD: applicability and capability, DRAW tools, MODIFY tools, TEXT, DIMENSION, PROPERTIES.

Books / References:

1. *Bhatt N.D. and Panchal V.M., —Engineering Drawing‖, Charotar Publishing House, 50th Edition, 2010.*
2. *Basant Agarwal and Agarwal C.M., —Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.*
3. *Venugopal K. and Prabhu Raja V., —Engineering Graphics, New Age International (P) Limited, 2008.*
4. *Natrajan K.V., —A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2009.*
5. *Gopalakrishna K.R., —Engineering Drawing (Vol. I&II combined), Subhas Stores, Bangalore, 2007.*
6. *N S Parthasarathy And Vela Murali, —Engineering Graphics, Oxford University, Press, New Delhi, 2015.*
7. *Shah M.B., and Rana B.C., —Engineering Drawing, Pearson, 2nd Edition, 2009.*

Paper code: UCE271
Paper name: Engineering Drawing and Computer Graphics Lab **Credit: 4**
Total contact hours: 48 **L-T-P: 0-0-4**

Module 1: Lettering and drawing plane curves **Contact hours: 8**

Lettering, Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Module 2: Drawing projection of points, lines and plane surfaces **Contact hours: 8**

Drawing orthographic projection - Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module 3: Drawing projection of solids **Contact hours: 8**

Drawing projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

Module 4: Drawing projection of sectioned solids and development of surfaces
Contact hours: 8

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

Module 5: Drawing isometric and perspective projections **Contact hours: 8**

Drawing isometric projections – isometric scale –Isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions – Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Module 6: AutoCAD practice **Contact hours: 8**

Familiarization of AutoCAD application software, Use of DRAW tools, MODIFY tools, TEXT, DIMENSION, PROPERTIES.

Paper code: UHSS201
Paper name: Professional ethics and human values **Credit: 4**
Total contact hours: 40 **L-T-P-C: 2-0-0-4**

Module 1: Engineering Ethics Senses of 'engineering ethics' – variety of moral issues – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – professions and professionalism – professional ideals and virtues – theories about right action – self-interest – customs and religion – uses of ethical theories	**Contact hours: 4**
Module 2: Engineering as Social Experimentation Engineering as experimentation – engineers as responsible experimenters – codes of ethics – a balanced outlook on law – the challenger case study	**Contact hours: 4**
Module 3: Responsibility for safety Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk	**Contact hours: 4**
Module 4: Responsibilities and Rights Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee rights – intellectual property rights – discrimination	**Contact hours: 4**
Module 5: Global issues Multinational corporations – environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – sample code of conduct	**Contact hours: 4**

TEXTBOOKS/REFERENCES:

1. Mike Martin and Roland Schinzinger, "*Ethics in Engineering*", McGraw Hill, New York, 1996.
2. Charles D Fleddermann, "*Engineering Ethics*", prentice Hall, New Mexico, 1999.

3. LauraSchlesinger, "*How Could You Do That: The Abdication of Character, Courage, and Conscience*", Harper Collins, New York, 1996.
4. Stephen Carter, "*Integrity*", Basic Books, New York, 1996.

Semester III

B. Tech (3rd sem) in Instrumentation Engineering Syllabus Details (July 2020 onwards)

Paper code: UMA301 **Paper name: Mathematics-III** **Credit: 8**
Total contact hours: 45 **L-T-P: 3-1-0**

Module 1: Complex Variable **Contact hours: 13**

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties, Complex integration, Cauchey's Theorem, Residues.

Module 2: Transformations **Contact hours: 19**

Laplace Transform: Laplace transformation of elementary functions, inverse Laplace transform, Linearity, Laplace transform of derivatives and integrals, shifting Theorems, Laplace transform of unit step Application to differential equations.

Z-Transform: Definition, properties, Z-transform of some basic sequences, Z-transforms of some basic discrete functions, shifting theorems.

Module 3: Partial Differential Equations **Contact hours: 13**

First order: First order partial differential equations, solutions of first order linear and non-linear PDEs.

Higher order: Solution to homogenous and non-homogenous linear partial differential equations, second and higher order by complimentary function and particular integral method, Method of separation of variables.

Books / References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed. Wiley, 1968.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
8. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.
9. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
10. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.
11. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010.

B. Tech (3rd sem) in Instrumentation Engineering Syllabus Details (July 2020 onwards)

Paper code: UPH301 **Paper name: Applied Physics** **Credit: 4**
Total contact hours: 24 **L-T-P: 2-0-0**

Module 1: **Contact hours: 12**

1. Electromagnetic Theory: Introduction to Maxwell's Equations; Charge Conservation and Displacement current. Electromagnetic waves in free space and in a medium, Poynting theorem.

2. Photonics And Fibre Optics: Propagation mechanism of light through an optical fibre. Angle of acceptance and numerical aperture. Types of optical fibres (material, refractive index, mode), Attenuation, Dispersion, Fibre Optical Communication system (Block diagram)

Module 2: **Contact hours: 12**

1. Thin Film Physics: Basic of Thin films and Nanostructures, Fabrication of thin films, Characterization of thin films, Role of thin films in Devices.

2. Engineering Materials & Techniques: Dielectrics, Piezoelectric and Ferromagnetic materials, Materials for special applications, Modern techniques for materials studies, X-ray diffraction, Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, Differential Scanning Calorimeter**.**

Books / References:

1. G. Cao, "Nanostructures &Nanomaterials: Synthesis, Properties & Applications" Imperial College Press, 2004.

2. Thin Film Phenomena by K. L. Chopra, McGraw Hill 1969

3. D.J. Griffiths, Introduction to Electrodynamics. 4th Edition, PHI Learning, New Delhi. (2012).

4. J.D. Jackson, Classical Electrodynamics. 3rdEdition, Wiley India. (1998)

5. Introduction to Materials Science and Engineering. William J. Callister, John Wiley & Sons, Inc. (2007).

6. J. P. Bentley, Principles of Measurement Systems, Longman(2000).

B. Tech (3rd sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE301 **Paper name: Network Theory** **Credit: 8**
Total contact hours: 45 **L-T-P: 3-1-0**

Module 1: **Contact hours: 12**

Introduction: Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems, Voltage and Current divide rule, Kirchoff's Voltage Law and Current Law ,Independent & Dependent Sources, Source Conversion , Star-Delta Transformation, A.C fundamentals ,Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals-Average value and R.M.S value.

Coupled circuits: Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, Modeling of coupled circuits, and Solution of problems.

Resonant Circuits: Series and Parallel circuits**,** Series and Parallel Resonance, Impedance and Admittance Characteristics, Quality Factor, Half-Power Points, Bandwidth, Resonant voltage rise, Transform diagrams, Solution of Problems.

Module 2: **Contact hours: 12**

Circuit Transients: (using differential equation method**)** DC Transient in R-L & R-C circuits with and without initial charge, R-L-C circuits, AC transients in sinusoidal R-L, R-C, & R-L-C circuits, solution of problems

Laplace transforms: Introduction,Properties of Laplace Transform, Initial Value Theorem and Final Value Theorem, Inverse Laplace Transform, applications in circuit analysis, Partial Fractions expansion, Heaviside's Expansion Theorem, Impulse, Step & Sinusoidal response of RL, RC, and RLC circuits. Concept of Convolution theorem and its application. Solution of Problems with DC & AC sources.

Module 3: **Contact hours: 10**

Network equations: Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's & Maximum power transfer theorem. Millman's theorem and its application in three phase unbalanced circuit analysis. Solution of Problems with DC & AC sources.

Graph of Network: Concept of Tree, Branch, Tree link, junctions, Incident matrix, Tie-set matrix and loop currents, Cut-set matrix and node pair potentials, duality, solution of problems.

Module 4: **Contact hours: 11**

Two port networks analysis: Open circuit Impedance & Short circuit Admittance parameter, Transmission parameters, Hybrid parameters and their inter relations. Driving point impedance & Admittance. Solution of Problems with DC & AC sources.

Three phase circuits: Three phase balanced/ unbalanced voltage sources, analysis of three phase3-wire and 4-wire circuits with star and delta connected loads, balanced and unbalanced – phasor diagram of voltages & currents, power and power factor measurements in three phase circuit.

Books / References:

1. Network Analysis, M.E.Van Valkenburg (Prentice Hall)
2. Engineering Circuit Analysis, W.H.Hayt, J.E.Kenmerly, S.M.Durbin, (TMH)
3. Network and Systems, Ashfaq Husain,(Khanna Book Publisher)
4. Network and Systems, D.Roychowdhury,(New Age International)
5. Modern Netwok Analysis, F.M.Reza & S.Seely, McGraw Hill.

B. Tech (3rd sem) in Instrumentation Engineering Syllabus Details (July 2020 onwards)

Paper code: UIE302 **Paper name: Electronic Devices & Circuits** **Credit: 6**
Total contact hours: 35 **L-T-P: 3-0-0**

Module 1: Basics of Semiconductors: **Contact hours: 7**
The energy band model, Equilibrium concentrations of electrons and holes inside the energy band, Carrier Statistics- Fermi Dirac Statistics and Boltzmann's Statistics, The drift of carrier in an electric field, Carrier flow by diffusion, Einstein relations, The Hall effect, Carrier Mobility. Introduction to P-N junction, description of P-N junction action, electrical breakdown in junction, Schottkey Junction.

Module 2: Diode circuits: **Contact hours: 6**
Ideal diode characteristics, Half-wave, Full-wave, Bridge rectifiers, Clipping and clamping circuits.

Module 3: Bipolar Junction Transistor: **Contact hours: 7**
Basic working principle, Input and Output Characteristics, Basic Configurations, Biasing, Operating point, Load line, Stabilization of Operating point, Self-Bias, Fixed Bias and Voltage Divider Bias, BJT small signal model.

Module 4: Field Effect Transistors: **Contact hours: 4**
Basic Concepts, JFET: Basic working principle, IV Characteristics, pinch off voltage, parameters, MOSFET: Basic working principle, Transfer and Output Characteristics.

Module 5: Power amplifier: **Contact hours: 5**
Introduction-Definition and amplifier types, Series fed Class A power amplifier, Transformer coupled class-A amplifier and efficiency, Class B amplifier operation and efficiency, Push Pull power amplifier.

Module 6: Feedback Amplifiers and Oscillators: **Contact hours: 6**
Classification of feedback amplifiers, Feedback concepts, properties of negative feedback, Principles of operation of four types of feedback amplifiers (voltage series/shunt, current series/ shunt). Input impedance, output impedance, advantage and disadvantages. Oscillator: Oscillator operations, phase shift oscillator, wien bridge oscillator, tuned oscillator, crystal oscillator.

Books / References:

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson,2014.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley & Sons, 2006.
4. C.T. Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford Univ. Press, 2011.
6. Integrated Electronics: Analog and Digital Circuits and Systems. by Millman and Halkias (Tata McGraw Hill)
7. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall,9th Edition,2006.
8. Micro Electronic Circuits – Sedra A.S. and K.C. Smith, Oxford University Press, 5th ed.
9. Micro Electronic Circuits: Analysis and Design – M.H. Rashid, Thomson PWS Publ., 1999.
10. Principles of Electronic Circuits – S.G.Burns and P.R.Bond, Galgotia Publications, 2nd Edn.., 1998.

B. Tech (3rd sem) in Instrumentation Engineering Syllabus Details (July 2020 onwards)

Paper code: UIE303 **Paper name: Electrical & Electronic Measurements** **Credit: 6**
Total contact hours: 35 **L-T-P: 3-0-0**

Module 1: Measurement of Voltage and Current **Contact hours: 8**

Introduction to Electrical Instruments: Operating forces, constructional details, types of support, control systems and damping systems.

Galvanometers: Construction, basic principle and applications of D'Arsonval, ballistic and vibration galvanometer –Errors and compensation

Voltmeters and Ammeters: Construction, basic principle, application and comparison of moving coil, moving iron meters, dynamometer type, electrostatic type, thermal type and rectifier type – Extension of range and calibration of voltmeter and ammeter – Errors and compensation.

Module 2: Measurement of Power and Energy **Contact hours: 6**

Electrodynamometer type wattmeter: Theory- Errors and compensation–Calibration and testing-Measurement of power in three phase circuits. Single Phase Induction type energy meter: Theory- Errors and compensation–Calibration and testing-Phantom Loading.

Module 3: Potentiometers and Instrument Transformers **Contact hours: 7**

Potentiometers: DC potentiometer – Basic circuit, standardization – Laboratory type (Crompton's) --Applications of DC potentiometers. AC potentiometer – Drysdale (polar type) type – Gall-Tinsley (coordinate) type –Applications of AC potentiometer

Instrument Transformers: C.T and V.T ---construction, theory and phasor diagram.

Module 4: Measurement of Resistance **Contact hours: 6**

Measurement of medium resistance: Wheatstone bridge method ---Series and shunt type ohmmeter.
Measurement of low resistance: Ammeter-voltmeter method – Kelvin's double bridge –
Measurement of high resistance: Direct deflection methods – Loss of charge method.
Measurement of earth resistance: Megger-- Fall of potential method.

Module 5: Measurement of Impedance **Contact hours: 5**

Measurement of inductance: Maxwell's bridge—Hay's bridge—Anderson's bridge—Owen's bridge
Masurement of capacitance: DeSauty's and Schering bridge.
Measurement of mutual inductance and frequency: Heaviside mutual inductance bridge – Campbell's bridge—Wein's bridge.
Errors in A.C. bridge methods and their compensation

Module 5: Electronic Instruments **Contact hours: 3**

Analog Electronic Ammeter, Voltmeter, Ohmmeter and multimeter.

Books / References:

1. E.W.Golding & F.C.Widdis, 'Electrical Measurements & Measuring Instruments', H. Wheeler & Co.
2. A.K. Sawhney, 'Electrical & Electronic Measurements and Instrumentation', Dhanpath Rai & Co (P) Ltd.
3. J.B.Gupta, 'A Course in Electronic and Electrical Measurements and Instrumentation', S.K. Kataria & Sons, Delhi.

B. Tech (3rd sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE304 **Paper name: Fundamentals of Instrumentation** **Credit: 6**
Total contact hours: 39 **L-T-P: 3-0-0**

Module 1: **Contact hours: 6**
Introduction to measurement system. Typical application of instrumentation systems. Functional elements of a measurement system. Classification of instruments. Role of Sensors and Transducers in measurement systems.

Module 2: **Contact hours: 6**
Amplifier, Feedback in amplifier, Operational Amplifier and its application. Notion of Signal conditioning.

Module 3: **Contact hours: 7**
Introduction to measurements. Physical measurement. Forms and methods of measurements. Fundamental SI Units. Derived Units. Definition of standards. International standards. Primary standards. Secondary standards. Working standards.

Module 4: **Contact hours: 6**
Measurement Errors. Human Error. Systematic Error. Limiting and Random Errors. Statistical analysis of measurement data. Probability of Errors. Error estimates from the Normal Distribution. Curve Fitting – Method of Least Squares. Chi-Square test.

Module 5: **Contact hours: 8**
Static characteristics of measurement system, Dependence on environmental effects. Loading Effects on measurement. Dynamic characteristics of measurement system. Step-response and Frequency response of first and second order system

Module 6: **Contact hours: 6**
Testing and calibration: Traceability. Measurement reliability. Primary calibration. Secondary calibration. Direct calibration. Indirect calibration. Routine calibration. Calibration of a voltmeter.

Books / References:

1. A K Ghosh: Introduction to Instrumentation and Control, Prentice Hall of India, New Delhi 2004.
2. A K Sawhney: A course on electrical and electronic measurements and instrumentation, Dhanpat Raj & Co, 2005
3. D Patranabis: Principle of Industrial Instrumentation, Tata McGraw-Hill, New Delhi 2004
4. John P. Bentley: Principles of measurement systems, 3rd edition, Addison Wesley Longman, 2000.

B. Tech (3rd sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE371 **Paper name: Network Theory Lab** **Credit: 2**
Total contact hours: 2 hours per week **L-T-P: 0-0-2**

LIST OF EXPERIMENTS:

1. To verify the Kirchhoff's Voltage Law (KVL) for the given electrical circuit.
2. To verify the Kirchhoff's Current Law (KCL) for the given electrical circuit.
3. To verify the Ohm's Law and plot the V-I characteristics.
4. To verify Superposition Theorem using NI-Multisim and verify the results theoretically.
5. To verify the Thevenin's Theorem using NI- Multisim Software and verify the results theoretically.
6. To verify the Norton's Theorem using NI-Multisim Software and verify the results theoretically.
7. To verify Maximum Power transfer Theorem, and plot graph of-
   a) Efficiency (η) v/s R_L (Load Resistance).
   b) Load Power (P_L) v/s R_L (Load Resistance).
8. To study the Transient Response/Analysis of a RC Series circuit.
9. To study the Transient Response/Analysis of a RL Series circuit.
10. To study Resonance in RLC series Circuit.
11. To study Resonance in parallel RLC Circuit.
12. To measure input and output impedance of a given two port network. (To calculate and verify Z-parameters of a two port Network).
13. To calculate and verify 'Y' parameters of two-port network.
14. To study the properties of delta-star connection.
15. To verify the Reciprocity Theorem using NI-Multisim and find out the transfer resistance. Also, verify the results theoretically.
16. To verify the Millman's Theorem using NI-Multisim and verify the results theoretically.
17. To verify the Compensation Theorem Using NI-Mutisim and verify the results theoretically.
18. Study of Transients in an RC Series Circuit using MATLAB Command.
19. Frequency Response of a High-Pass Filter using MATLAB Command.
20. Frequency Response of a Low-Pass Filter Using MATLAB Command.
21. Voltage and Current Waveforms in a Resistive Circuit Using MATLAB Command.
22. Study of Voltage and Current Waveforms in an Inductive and Capacitive Circuit with an AC Input using MATALB Command.
23. Validation of Maximum Power Transfer Theorem Using MATLAB Command.

B. Tech (3rd sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE372 **Paper name: Electronic Devices & Circuits Lab** **Credit: 2**
Total contact hours: 2 hours per week **L-T-P: 0-0-2**

LIST OF EXPERIMENTS:

Exp. 1:- I-V characteristics Study of a P-N junction diode

Exp 2:- To design a Half wave rectifier and study its ripple factor

Exp 3:- To design a Centre-tap/Bridge full wave rectifier with shunt capacitance/series inductance filter and study its ripple factor for different values of capacitance/inductance.

Exp. 4:- To design a diode clipping circuit and study output waveforms.

Exp. 5:- To design a diode clamping circuit and study output waveforms.

Exp. 6:- To study Input and Output characteristics of a BJT

Exp 7:- To design a common emitter Fixed/Voltage divided Biasing transistor Amplifier circuit and study its Amplification factor.

Exp. 8:- To Study the Transfer and Output characteristics of a MOSFET.

Exp. 9:- To study common source and source follower configuration.

Exp. 10:- To design class A, Class B and Class C power amplifier and determine the efficiency of the amplifiers

Exp. 11:- To study negative and positive feedback amplifier.

Exp. 12. To design and study wien bridge oscillator, tuned oscillator, crystal oscillator

B. Tech (3rd sem) in Instrumentation Engineering Syllabus Details

(July 2020 onwards)

Paper code: UIE373 Paper name: Electrical & Electronic Measurements Lab Credit: 2
Total contact hours: 2 hours per week L-T-P: 0-0-2

LIST OF EXPERIMENTS:

1. Calibration of analog ammeter
2. Calibration of analog voltmeter
3. Extension of range of moving coil ammeter and voltmeter.
4. Calibration of electrodynamometer type wattmeter.
5. Measurement of power using electrodynamometer type wattmeter
6. Calibration and testing of energy meters.
7. Measurement of unknown resistance using Wheatstone's bridge.
8. Measurement the low resistance using Kelvin's Double Bridge.
9. Measurement of Inductance by Maxwell's Bridge.
10. Measurement of Inductance by Hay's Bridge
11. Measurement of Capacitance by De Sauty's Bridge.
12. Measurement of Capacitance by Schering's Bridge.
13. Measurement of Frequency by Wein's Bridge.
14. Measurement of earth resistance using Megger.

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B. Tech (4th sem) in Instrumentation Engineering Syllabus Details (July 2020 onwards)

Paper code: UMA401 **Paper name: Numerical Methods** **Credit: 6**
Total contact hours: 40 **L-T-P: 3-0-0**

Module 1: Transcendental and Polynomial Equations **Contact hours: 10**

Methods of iteration for finding solution of algebraic and transcendental equations: Newton Raphson Method, Regula-Falsi Method, Bisection Method, Secant Method. Solution of linear simultaneous equations by Gauss Elimination Method & Gauss Siedal Method.

Module 2: Interpolation and Extrapolation **Contact hours: 10**

Difference table, Newton's Forward and Backward interpolation formulae, Lagrange's Interpolation Formula.

Module 3: Numerical Differentiation & Integration **Contact hours: 10**

Numerical differentiation; Numerical Integration, Trapezoidal, Simpson's Rules and Gaussian Quadrature Formula.

Module 4: Numerical Solution of Ordinary Differential Equations **Contact hours: 10**

Euler method, Modified Euler Method, Runge - Kutta Method and Milne's Predictor – Corrector Method.

Books/References:

1. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI learning Pvt Ltd.
2. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical Methods for Scientific and Engineering computation, New Age International Publishers.
3. E. Balagurusamy, Numerical Method, Tata McGraw Hill Publication.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
8. Xavier: C Language and Numerical Methods.

B. Tech (4th sem) in Instrumentation Engineering Syllabus Details (July 2020 onwards)

Paper code: UEE401 **Paper name: Electrical Machines** **Credit: 6**
Total contact hours: **L-T-P: 3-0-0**

DC MACHINES [10 hours]

Introduction to DC machines, study and drawing of various parts of a DC machine, magnetic circuit and flux path, DC generators, lap and wave winding (very briefly), EMF equation, shunt, series and compound generators, losses and efficiency studies, armature reaction, generator characteristics studies, etc.
Principle of DC motor, electromagnetic torque, driving and retarding torque, Back EMF, shunt, series and compound motors, speed relations, losses and efficiency studies, motor characteristics studies, speed control of DC motors, DC motor starters, Industrial applications of DC machines, Electric braking, Permanent magnet DC motors etc.

TRANSFORMERS [7 hours]

Introduction, construction and working principles, Ideal transformer, EMF equation, voltage transformation ratio, practical transformer on no-load and on–load, equivalent circuits, shifting impedances, transformer's tests, voltage regulation, losses and efficiency studies, polarity of transformer, autotransformer, applications.

INDUCTION MOTOR [7 hours]

Introduction, construction, types and working principle, slip, induction motor and transformer comparison, equivalent circuit, torque under starting and running conditions, , torque-slip curve, losses and efficiency studies, effect of change in supply voltage, starting methods, speed control, industrial applications in different areas.

SINGLE PHASE MOTORS [6 hours]

Introduction, conditions at starting, Double Revolving Field Theory, circuit model, cross-field theory, making single-phase IM self-starting, split-phase motor, capacitor start motor, capacitor start capacitor run motor, shaded pole motor, repulsion type motor, universal motor, industrial applications of single phase motors.

SYNCHRONOUS GENERATOR [5 hours]

Introduction, construction, armature winding, pitch and distribution factors, EMF equation, excitation systems, vector diagram of a loaded alternator, equivalent circuit, alternator on load (lagging, leading, unity p.f.), voltage regulation, parallel operation of alternators, applications.

SPECIAL MACHINES [5 hours]

Hysteresis motor, reluctance motor, two-phase servo motor, DC tachometers, stepper motor, Synchros and control transformers, applications.

Reference books --

1. A Text Book of Electrical Technology (Vol. 2) by B.L. Theraja and A.K. Theraja
2. Electric Machines by D.P. Kothari and I.J. Nagrath
3. Electrical Machinery by Dr. P.S. Bimbhra

B. Tech (4th sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE401 **Paper name: Analog Integrated Circuits** **Credit: 6**
Total contact hours: 35 **L-T-P: 3-0-0**

Basics of OPAMP – Ideal and practical characteristics, input bias currents, input offset current, input offset voltage, slew rate and common mode rejection ration (CMMR), etc.

Opamp as inverting, non-inverting, voltage follower, adder, subtractor, integrator, differentiator, logarithmic, antilogarithmic amplifier, multipliers, dividers and sample & hold device.

Differential and instrumentation amplifiers.

Comparators - inverting, non-inverting and Schmitt trigger

Rectifiers – half wave and full wave precision rectifiers

Mutivibrators – monostable and astable mutivibrators and their applications.

Wave generators – square and triangular waves.

Oscillators - phase shift and Wien's bridge oscillators using OPAMP.

Timer NE/SE555 – monostable and astable mutivibrators.

VCO and PLL.

Books/References:

1. Opamps and Linear Integrated Circuits – Driscol and Coughlin

2. Opamps and Linear Integrated Circuits – Ramakant A Gayakwad (PHI)

3. Opamps and Linear Integrated Circuits – S Jain and D Roychoudhury

4. Design with Operational Amplifiers and Analog Integrated Circuits – Sergio Franco

B. Tech (4th sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE402 **Paper name: Sensors and Transducers** **Credit: 6**
Total contact hours: 35 **L-T-P: 3-0-0**

Module 1 **Contact hours: 4**
Definition, classification and selection of transducers. Elastic elements: diaphragm, cantilever, bellows and bourdon tube.

Module 2 **Contact hours: 6**
Resistive transducers: basic principle of working of resistive transducer, potentiometers, strain gauges, resistive accelerometer; Brief explanation of RTD, thermistor and thermocouple. Signal conditioning circuits for resistive transducer.

Module 3 **Contact hours: 7**
Capacitive transducers: basic principle of working of capacitive transducer, different types of transducer (variable area, variable distance and variable dielectric constants) and capacitor microphone. Signal conditioning circuits for capacitive transducer.

Module 4 **Contact hours: 7**
Inductive transducers: basic principle of working of inductive transducer, variable reluctance transducers, different types of self and mutual inductance transducers, LVDT, RVDT, eddy current transducers, synchros and resolvers. Signal conditioning circuits for inductive transducer.

Module 5 **Contact hours: 5**
Optical transducers: photoconductive, photovoltaic, photodiode, photo transistor and pyrometers.
Piezo electric transducers: basic principle of working of piezoelectric transducers, materials and properties, and modes of deformation

Module 6: Feedback Amplifiers and Oscillators: **Contact hours: 6**
Other transducers: Hall Effect transducers, ultrasonic transducer, proximity transducer, magneto elastic transducers, magneto-resistive transducers, digital transducers, smart sensor, IC Sensor and fiber optic transducer.

Books/References:

1. Curtis D Johnson,Process Control and Instrumentation, PHI
2. D Patranabis, Sensors and Transducers, PHI, 2nd ed., 2003.
3. E. A. Doebelin, Measurement Systems: Application and Design, Mc Graw Hill, New York, 2003.
4. H. K. P. Neubert, Instrument Transducers, Oxford University Press, London and Calcutta
5. D.V.S. Murty, Transducers and Instrumentation, PHI, 1995.
6. A K Sawhney: A course on electrical and electronic measurements and instrumentation, Dhanpat Raj & Co, 2005

B. Tech (4th sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE403 **Paper name: Digital Electronics** **Credit: 8**
Total contact hours: 42 **L-T-P: 3-1-0**

1. Number Systems **Contact hours: 6**
Introduction to Digital systems, Introduction to number systems (Binary, Decimal, Octal, Hexadecimal), Number representation in binary (Signed, One's and Two's complement), Binary Codes (BCD, Excess-3, Gray, Alphanumeric, Seven segment display code and Error detection and correction codes), Digital Arithmetic (Binary, BCD, Excess-3 arithmetic).

2. Logic gates **Contact hours: 4**
Introduction to various logic systems (positive & negative), Truth Table, Logic gates (OR, AND, NOT, BUFFER, EX-OR, EX-NOR), Universal gates (NAND, NOR), Tristate logic gates.

3. Logic families **Contact hours: 5**
Significance and types of logic families (RTL, DTL, TTL), Characteristic parameters (Fan-out, Fan-in, Noise margin, Propagation Delay etc…).

4. Boolean Algebra and Simplification Techniques **Contact hours: 4**
Introduction to Boolean algebra and its postulates and theorems, SOP and POS Boolean expressions, Simplification techniques (using Boolean theorems, K-Map).

5. Combinational Circuits **Contact hours: 7**
Arithmetic circuits (Adder, Subtractor, parallel binary adder, BCD adder, carry-propagation-look-ahead-carry generator, magnitude comparator), Multiplexer, De-multiplexer, Encoder, Decoder, Parity generator-checker.

6. Sequential Circuits **Contact hours: 7**
Concept of multivibrator, Flip-flops (R-S flip-flop, J-K flip-flop, D flip-flop, T flip-flop), flip-flop with preset and clear inputs, level and edge triggered flip-flops, race-around condition in flip-flops, Counters and Registers (asynchronous and synchronous counters, UP/DOWN counters, Ring counter).

7. Programmable Devices **Contact hours: 5**
PROM, PLA, PAL, FPGA, CPLD

8. Data Converters and Memory Devices **Contact hours: 4**
D/A Converters, A/D Converters, Types of Memory Devices: ROM, PROM, static RAM, Dynamic RAM

Books/References:

1. Morris Mano, Prentice Hall of India, New Delhi: Digital Logic and Computer Design

2. Malvino, Tata McGraw Hill New Delhi: Digital Computer Electronics

3. A. Anand Kumar, PHI Learning Private Limited, Delhi: Fundamentals of Digital Circuits

4. Anil K. Maini, Wiley: Digital Electronics

B. Tech (4th sem) in Instrumentation Engineering Syllabus Details (July 2020 onwards)

Paper code: UMA471 **Paper name: Numerical Methods Lab** **Credit: 2**
Total contact hours: 2 hours per week **L-T-P: 0-0-2**

LIST OF EXPERIMENTS:

1. Program to find a root of a nonlinear equation using the Method of Bisection.
2. Program to find a root of a nonlinear equation using the Method of Regula-Falsi method.
3. Program to find the root of a nonlinear equation using the Newton-Raphson method.
4. Program to find the root of a nonlinear equation using the Secant Method.
5. Program to construct Lagrange's interpolation polynomial method.
6. Program to evaluate a definite integral by Trapezoidal rule
7. Program to evaluate a definite integral by Simpson's 1/3 rule.
8. Program to evaluate a definite integral by Simpson's 3/8 rule.
9. Program to find the solution of initial value problem using Euler's method.
10. Program to find the solution of initial value problem using improved Euler's method.
11. Program to find the solution of initial value problem using Modified Euler's method.
12. Program to find solution of initial value problem using fourth order Runge Kutta method.
13. Program to find solution of initial value problem using third order Runge Kutta method.
14. Program for solving ordinary differential equation by Milne method.

Books/References:

1. Introductory Methods of Numerical Analysis: S.S. Sastry, PHI learning Pvt Ltd.
2. Numerical Methods for Scientific and Engineering computation: M.K Jain, S.R.K Iyengar and R.K Jain, New age Inter-national Publishers.
3. Numerical Method: E. Balagurusamy, Tata McGraw Hill Publication.
4. Xavier: C Language and Numerical Methods.

B. Tech (4th sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UEE471 **Paper name: Electrical Machines Lab** **Credit: 2**
Total contact hours: 2 hours per week **L-T-P: 0-0-2**

LIST OF EXPERIMENTS:

1. Open circuit characteristics of a DC shunt generator
2. Load test on DC shunt generator
3. Load test on DC series generator
4. Speed control of DC shunt motor
5. Ratio and polarity test on single-phase transformer
6. Open and short circuit test on single-phase transformer
7. Load test on single-phase transformer
8. Study of various parts of three phase induction motor
9. No-load and blocked rotor test on 3-phase induction motor
10. Study of various parts of single-phase induction motor

B. Tech (4th sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE471 **Paper name: Analog Integrated Circuits Lab** **Credit: 2**
Total contact hours: 2 hours per week **L-T-P: 0-0-2**

LIST OF EXPERIMENTS:

1. Study on inverting, non-inverting and adder/summing amplifiers using OPAMP.
2. Study on integrator and differentiator circuits using OPAMP.
3. Study on differential and instrumentation amplifiers using OPAMP.
4. Study on inverting, non-inverting and Schmitt trigger comparators using OPAMP.
5. Study on monostable and astable mutivibrators using OPAMP.
6. Study on square and triangular wave generators using OPAMP.
7. Study on half wave and full wave precision rectifiers using OPAMP.
8. Study on phase shift and Wien's bridge oscillators using OPAMP.
9. Study on astable and monostable mutivibrators using timer NE/SE555.
10. Study on voltage controlled oscillator using LM566
11. Design of an electronic circuit using OPAMP (Instructor will assign this task).
12. Simulation studies on integrator and differentiator circuits using OPAMP.
13. Simulation studies on differential and instrumentation amplifiers using OPAMP.
14. Simulation studies on square and triangular wave generators using OPAMP.
15. Simulation studies on phase shift and Wien's bridge oscillators using OPAMP.
16. Simulation studies on voltage controlled oscillator using LM566.

B. Tech (4th sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE472 Paper name: Sensors and Transducers Lab Credit: 2
Total contact hours: 2 hours per week L-T-P: 0-0-2

LIST OF EXPERIMENTS:

1. To determine the I-V Characteristics of LDR and Photodiode.

2. To determine the I-V Characteristics of Phototransistor.

3. To study strain gauge and plot the change in resistance with respect to strain or weight. Also, determine its sensitivity.

4. To study LVDT and plot the response of output voltage verses displacement. Also, determine its sensitivity.

5. To study RTD and plot the response between resistance verses temperature. Also, design a suitable signal conditioning circuit for converting the change in resistance to voltage.

6. To study thermocouple and plot the response between voltage verses temperature. Also, design a suitable signal conditioning circuit to linearize the output with respect to the input.

7. To study thermistor and design a suitable signal conditioning circuit for converting the change in temperature to output voltage.

8. To study bellows and plot its characteristics.

9. To study bourdon tube and plot its characteristics.

10. To study temperature compensation in transducers.

B. Tech (4th sem) in Instrumentation Engineering Syllabus Details
(July 2020 onwards)

Paper code: UIE473 Paper name: Digital Electronics Lab Credit: 2
Total contact hours: 2 hours per week L-T-P: 0-0-2

LIST OF EXPERIMENTS:

1. Input-output verification of logic gates (ICs 74xx-group).
2. Practical validation of De-Morgan's theorem.
3. Practical validation of Boolean expressions and its minimized expression.
4. Implementation of various gates/Boolean expression by using universal gates only.
5. Design and study of half-adder and full-adder circuits.
6. Design and study of half-subtractor and full-subtractor circuits.
7. Design and study of digital multiplexer (4:1 / 8:1) circuit.
8. Design and study of digital de-multiplexer (1:4 / 1:8) circuit.
9. Design and study of Encoder circuit.
10. Design and study of Decoder circuit.
11. Study of Flip-flop circuits (R-S and J-K).
12. Study of asynchronous counters.
13. Study of synchronous counters.