VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES (VISTAS)
B.Tech. Computer Science and Engineering Specialization with
Artificial Intelligence and Machine Learning

COURSES OF STUDY AND SCHEME OF ASSESSMENT

(Minimum credits to be EARNED: 170)

Category		Course Title	Hours/Week				Maximum Marks		
			Lecture	Tutorial	Practical	Credits	CA	SEE	Total
SEMESTER I									
Basic Science	BSC	Chemistry	3	1	0	4	40	60	100
Basic Science	BSC	Mathematics – I (Calculus & Linear Algebra)	3	1	0	4	40	60	100
Engineering Course	ESC	Programming for Problem Solving	3	0	0	3	40	60	100
Basic Science Lab	LC	Chemistry Lab	0	0	4	2	40	60	100
Engineering Lab	LC	Programming for problem solving Lab	0	0	4	2	40	60	100
Engineering Course	LC	Workshop/Manufacturing Practices	1	0	4	3	40	60	100
Total			**10**	**2**	**12**	**18**			
SEMESTER II									
Humanities	HSMC	English	2	0	0	2	40	60	100
Basic Science	BSC	Physics (Semiconductor Physics)	3	1	0	4	40	60	100
Basic Science	BSC	Mathematics – II (Probability and Statistics)	3	1	0	4	40	60	100
Engineering Course	ESC	Basic Electrical Engineering	3	1	0	4	40	60	100
Engineering Course	ESC	Engineering Graphics & Design	1	0	4	3	40	60	100
Basic Science Lab	LC	Physics Lab(Semiconductor Physics)	0	0	4	2	40	60	100
Engineering Lab	LC	Electrical Engineering Lab	0	0	2	1	40	60	100
Humanities Lab	LC	English Lab	0	0	2	1	40	60	100
Total			**12**	**3**	**12**	**21**			

CHEMISTRY 3 1 0 4

Category : **Basic Science Course**

Course Objective:

- To learn about the molecular orbitals, ionic interactions and periodic properties.
- Rationalise periodic properties such as ionization potential, electro negativity, Oxidation states and electro negativity.
- List major chemical reactions that are used in the synthesis of molecules.

UNIT I **ATOMIC AND MOLECULAR STRUCTURE, INTERMOLECULAR FORCES AND POTENTIAL ENERGY SURFACE** **12**

Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN.

UNIT II **SPECTROSCOPIC TECHNIQUES AND APPLICATIONS** **12**

Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Diffraction and scattering

UNIT III **USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA** **12**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.

UNIT IV **PERIODIC PROPERTIES** **12**

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

UNIT V **ORGANIC REACTIONS AND SYNTHESIS OF A DRUG MOLECULE** **12**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Total : 60 h

TEXT BOOKS:

1. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane.
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell.

3. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.

REFERENCE BOOKS:

1. Physical Chemistry, by P. W. Atkins.
2. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 8th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp.
3. University chemistry, by B. H. Mahan.

Upon completion of the course, students will be able to:

Course Outcome	Description	Knowledge Level
CO1	Determine and understand the operation of electrochemical systems for the production of electric energy, i.e. batteries and fuel cells.	K5
CO2	Apply formalisms based on molecular symmetry to predict spectroscopic properties.	K3
CO3	Explain the relation between the intermolecular forces present within a substance and the temperatures associated with changes in its physical state.	K5
CO4	Explain general corrosion in terms of electrochemistry	K5
CO5	Explain the arrangement of elements in the periodic table and relate the arrangement to electronic configuration, bonding and properties.	K5

MATHEMATICS - I(CALCULUS AND LINEAR ALGEBRA) 3 1 0 4

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT I CALCULUS - 1 12

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT II CALCULUS - 2 12

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

UNIT III MATRICES 12

Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix.

UNIT IV VECTOR SPACES - 1 12

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank-nullity theorem, composition of linear maps, Matrix associated with a linear map.

UNIT V VECTOR SPACES – 2 12

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases.Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Total: 60 h

TEXT BOOKS:

1. Erwin kreyszig G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition Pearson, Reprint, 2002.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,Reprint, 2010
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008..

REFERENCE BOOKS:

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

2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Upon completion of the course, students will be able to:

Course Outcome	**Description**	**Knowledge Level**
CO1	To apply differential and integral calculus to notions of curvature and to improper integrals. A part from some applications it gives a basic introduction on Beta and Gamma Functions	K3
CO2	To introduce the fundamental to application of analysis to Engineering problems.	K4
CO3	To develop the essential tool of vector spaces in engineering.	K3
CO4	To develop the essential tool of matrices in engineering.	K3
CO5	The essential tools of matrices and linear algebra including linear transformations, Eigen values, diagonalization and orthogonalization.	K4,K6

PROGRAMMING FOR PROBLEM SOLVING 3 0 0 3

Course Objective:

- To understand the basic concepts of programming – Flow chart, Pseudocode.
- To learn the fundamentals of C programming - declarations, operators, expressions and control statements.
- To learn the manipulation of strings, functions, pointers and file operations.
- To understand the concepts of arrays, basic sorting and searching algorithms.
- To find the order of time complexity of basic algorithms

UNIT I INTRODUCTION TO PROGRAMMING 9

Introduction to Programming (Flow chart/pseudo code, compilation etc.), Variables (includingdata types) -Arithmetic expressions and precedence, Conditional Branching and Loops -Writing and evaluation of conditionals and consequent branching - Iteration and loops

UNIT II ARRAYS AND BASIC ALGORITHMS 9

Arrays (1-D, 2-D), Character arrays and Strings, Searching, Basic Sorting Algorithms, Finding roots of equations, Notion of order of time complexity through example programs

UNIT III FUNCTIONS AND POINTERS 9

Functions (including using built in libraries), Parameter passing in functions, call by value,Passing arrays to functions: idea of call by reference, Recursion with example programs such asFinding Factorial, Fibonacci series, etc. Pointers - Defining pointers, Use of Pointers in self-referential structures

UNIT IV STRUCTURES AND UNIONS 9

Structures - Defining structures and Array of Structures,Structures containing Pointers, Unions - Storage classes: auto, static, extern, register – Dynamic memory allocation

UNIT V STRING FUNCTIONS AND FILES 9

Strings - library string functions, pointers in strings, pointers and function arguments, Files - file Operations, processing a file, Preprocessor directives, use of typedef, Command line arguments, Enumerated data types.

Total: 45 h

TEXT BOOKS:

1. Byron Gottfried, “Schaum's Outline of Programming with C”, McGraw-Hill
2. E. Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, PrenticeHall of India
2. YashavantKanetkar, “Let Us C”, BPB Publications
3. Ashok.N.Kamthane, “Computer Programming”, Pearson Education (India)

Upon completion of the course, students will be able to:

Course Outcome	Description	Knowledge Level
CO1	Develop a high level programming code	K3
CO2	Construct a stepwise solution for complex problems	K3
CO3	Evaluate the various functional operations that are available	K5
CO4	Make use of various c operations like array, pointer, strings and searching method.	K3
CO5	Develop a C module for a given set of instruction.	K6

CHEMISTRY PRACTICAL 0 0 4 2

Course Objective:

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to

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

List of Experiments:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .

Total: 30 h

Upon completion of the course, students will be able to:

Course Outcome	Description	Knowledge Level
CO1	To estimate the rate constants of reactions, freezing point depression and partial coefficient of immiscible liquids.	K5
CO2	To develop a small drug molecule and analyze a salt sample.	K3
CO3	To find the viscosity and partition coefficient of a substance.	K1
CO4	To determine the saponification value of an liquid	K5

CO5	To determination of cell constant and conductance of solutions	K5

PROGRAMMING FOR PROBLEM SOLVING LABORATORY 0 0 4 2

Course Objective:

To design and develop C Programs for various applications

List of Experiments:

1. Familiarization with programming environment
2. Simple computational problems using arithmetic expressions
3. Problems involving if-then-else structures
4. Iterative problems
5. 1D Array manipulation
6. Matrix problems
7. String operations
8. Simple functions
9. Solving Numerical methods problems
10. Recursive functions
11. Pointers and structures
12. File operations

Total: 30 h

Upon completion of the course, students will be able to:

Course Outcome	Description	Knowledge Level
CO1	Determine the advanced features of the C language	K5
CO2	Develop the model data using primitive and structured types.	K5
CO3	Construct programs that demonstrate effective use of C features including arrays, structures, pointers and files.	K4
CO4	Develops the ability to analyze a problem, develop an algorithm to solve it.	K5
CO5	Develops the use of the C programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.	K6

WORKSHOP/MANUFACTURING PRACTICES 0 0 4 2

1. Machine shop (10 hours)

To make Facing and plain turning, step turning, drilling in the lathe

2. Fitting shop (8 hours)

To make square, V joint in bench fitting as per the given dimension And Tolerances

3. Carpentry (6 hours)

To make half lap joint, dovetail, TEE Lap joint

4. Electrical & Electronics (8 hours)

(i) To make fluorescent lamp wiring.

(ii) To make stair case wiring.

(iii) To make residential wiring.

(iv) To measure Peak-peak, rms, period, frequency using CRO.

(v) To solder components devices and circuits by using general purpose PCB.

5. Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs)

To make single, butt, lap and T fillet joint by arc welding with the back hand and fore hand welding techniques as per the given dimensions.

6. Plumbing Works

Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

7. Sheet Metal Work

To make simple Dust pan, Rectangular trays in sheet metal with the jigs as per the given Dimensions.

Total: 30 h

Upon completion of the course, students will be able to:

Course Outcome	**Description**	**Knowledge level**
CO1	Experiment with facing, Turning and various types of fitting joint	K3
CO2	Develop the half lap joint, TEE Lap joint carpentry and welding.	K6
CO3	Understand the basic wiring for fluorescent lamp, Staircase, residential wiring.	K2
CO4	Developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering	K3
CO5	Make a Basic pipe connections for Mixed pipe material connection and Pipe connections with different joining components	K6

ENGLISH 2 0 0 2

Course Objective:

- To acquire ability to speak effectively in real life situations.
- To write letters and reports effectively in formal and business situations.
- To develop listening skills for academic and professional purposes.
- To gain effective speaking and listening skills in communication.
- To develop the soft skills and interpersonal skills to excel in their career.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment procedures.

UNIT I VOCABULARY BUILDING 10

General Vocabulary –Nouns- Compound nouns, Word borrowing & Word making, Foreign machinery in English, Dictionary and Thesaurus usages, Synonyms , Antonyms, Prefixes and Suffixes, Homonyms, Homographs and Homophones, Changing words from one form to another,Acronyms and Abbreviations.

UNIT II BASIC WRITING 10

Sentences structures –Kinds of sentences, Types of sentences, Clauses and Phrases,Punctuations, Word Links and Connectives, Summarizing, Precise writing,Paragraph Writing.

UNIT III IDENTIFYING COMMON ERRORS IN ENGLISH 10

Articles, Prepositions, Subject-verb Agreement, Pronouns - Relative pronouns, Demonstrative pronouns, Misplaced Modifiers, Redundancies, Clichés, Infinitives& Gerund

UNIT IV NATURE AND STYLE OF SENSIBLE WRITING 10

Describing people, place and situations, Process description, Definitions, Numerical Expressions, Information Transfer- Flow chart Bar chart and Pie chart, Checklists, Writing introduction and conclusion.

UNIT V WRITING PRACTICES 10

Letter Writing- Formal & Informal Letters, Report Writing- Letter Report, Accident Report, Investigation Report and Survey, Essay writing, Comprehension Passages.

Total: 30 h

TEXT BOOKS:

1. English for Scientists, Prof. K.R.Lakshmi Narayanan, Former Head, Department of Humanities and Social sciences, Sri Venkateshwara College of Engineering, Pennalur,Sriperumbudur, Tamilnadu SCITECH PUBLICATIONS (INDIA PVT.LTD)2014

2. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd, Chennai: 2012.
3. Department of Humanities and Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
4. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd, Chennai: 2012.
5. Department of Humanities and Social Sciences, Anna University, ''English for Engineers and Technologists'' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
6. M.AshrafRizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Limited, New Delhi.2009.

REFERENCE BOOKS:

1. Practical English Usage. Michael Swan. OUP. 2005
2. Remedial English Grammar. F.T. Wood. Macmillan.2007.
3. On Writing Well. William Zinsser. Harper Resource Book. 2012.
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2010.
5. Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press. 2018.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

Upon completion of the course, students will be able to:

Course Outcome	**Description**	**Knowledge Level**
CO1	List out a wide range of technical vocabulary to interpret the professional texts with attention to ambiguity, complexity, and aesthetic value	K4
CO2	Discover ways to respond to peers' and comprehend different spoken discourses/excerpts in different accents.	K4
CO3	Assess and write cohesively, coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.	K5
CO4	Evaluate the interpretive skill and analytical proficiency in different genres of texts adopting various reading strategies.	K5
CO5	Interpret speaking skills to speak clearly confidently and comprehensively using appropriate communicative strategies	K5

PHYSICS **3 1 0 4**

(SEMICONDUCTOR PHYSICS)

UNIT I ELECTRONIC MATERIALS **12**

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT II SEMICONDUCTORS **12**

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

UNIT III LIGHT-SEMICONDUCTOR INTERACTION **12**

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulate demission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT 4 MEASUREMENTS **12**

Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV-Vis spectroscopy, absorption/transmission.

UNIT 5 ENGINEERED SEMICONDUCTOR MATERIALS **12**

Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Hetero junctions and associated band-diagrams

Total : 60 h

REFERENCE BOOKS:

1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
4. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
5. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
6. Online course: “Semiconductor Optoelectronics” by M R Shenoy on NPTEL
7. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

Upon completion of the course, students will be able to:

Course Outcome	Description	Knowledge Level
CO1	Understand the classical free electron theory of electronic materials.	K2
CO2	Identify new engineering materials such as nanomaterials and shape memory alloys	K3
CO3	Experiment with the semiconductor materials of interest for optoelectronic devices.	K3
CO4	Identify the direct and indirect band gap semiconductors and their applications.	K3
CO5	Construct the photovoltaic effect experiment and their applications.	K3

MATHEMATICS - II(PROBABILITY AND STATISTICS) 3 1 0 4

Course Objective:

The main objective of this course is to provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.

UNIT I BASIC PROBABILITY 12

Probability spaces- conditional probability- Independence- Bayes'rule- Discrete random variables- Continuous random variables- Expectation of Discrete Random Variables-Continuous Random variables.

UNIT II CONTINUOUS PROBABILITY DISTRIBUTIONS 12

Discrete Distributions-Binomial, Poisson, Geometric-Continuous Distribution-Normal,Uniform, Exponential and gamma densities

UNIT III BIVARIATE DISTRIBUTIONS 12

Discrete Distributions-Binomial, Poisson, Geometric-Continuous Distribution-Normal,Uniform, Exponential and gamma densities

UNIT IV BASIC STATISTICS 12

Measures of Central tendency:Mean, Median and Mode- Measure of Dispersion- Range, Standard Deviation and coefficient of variation- Moments Skewness and Kurtosis (Simple Problems)

UNIT V APPLIED STATISTICS 12

Introduction to Large and small sample – t-test-Single mean, difference of means, and Paired t-test . Small samples: Test for single mean, difference of means-F-test- Chi-square test for goodness of fit and independence of attributes

Total: 60 h

TEXT BOOKS:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
2. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

REFERENCE BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2019.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2012.
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.

Upon completion of the course, students will be able to:

Course Outcome	**Description**	**Knowledge Level**
CO1	The students will have a fundamental knowledge of the concepts of probability.	K2
CO2	Knowledge of standard distributions which can describe real life phenomenon.	K2
CO3	The notion of sampling distributions and statistical techniques used in engineering	K3
CO4	Use appropriate statistical methods in the analysis of simple datasets	K3
CO5	Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries	K3,K4

BASIC ELECTRICAL ENGINEERING 3 1 0 4

UNIT I DC CIRCUITS 12

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current andvoltage laws, Mesh and Nodal analysis, Analysis of simple circuits with dc excitation, Wye↔Delta Transformation, Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT II AC CIRCUITS 12

Representation of sinusoidal waveforms, peak and rms values, phasor representation, realpower, reactive power, apparent power, power factor. Analysis of single-phase ac circuitsconsisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phasebalanced circuits, voltage and current relations in star and delta connections.

UNIT III TRANSFORMERS 12

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

UNIT IV ELECTRICAL MACHINES & POWER CONVERTERS 12

Generation of rotating magnetic fields, Construction and working of a three-phase inductionmotor, Significance of torque-slip characteristic. Single phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. DC-DC buck and boost converters, duty ratio control. Single phase Bridge Rectifier, Single Phase voltage source inverters.

UNIT V ELECTRICAL INSTALLATIONS 12

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types ofWires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries.Elementary calculations for energy consumption, power factor improvement and batterybackup.

Total: 60 h

TEXT / REFERENCE BOOKS:

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.

2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2012.

3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.

4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.

5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

Upon completion of the course, students will be able to:

Course outcome	Description	Knowledge Level
CO1	Evaluate the behavior of any electrical and magnetic circuits.	K4

CO2	Analyze the behavior of any electrical and magnetic circuits. Formulate and solve various complex circuits.	K4
CO3	Identify the type of electrical machine used for that particular application.	K2
CO4	Demonstrate wiring, earthing and to do power factor calculations	K3
CO5	Apply the requirement of transformers in transmission and distribution of electric power and other applications.	K3

ENGINEERING GRAPHICS & DESIGN 1 0 4 3

Course Objective:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I INTRODUCTION TO ENGINEERING DRAWING AND PLANE CURVES 9

Curves used in engineering practices: Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid, Epicycloid, Hypocycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves. Scales – Plain, Diagonal and Vernier Scales.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 9

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes - Auxiliary Planes

UNIT III PROJECTION OF SOLIDS 9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method - Auxiliary Views

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 9

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section - Auxiliary Views. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ORTHOGRAPHIC PROJECTION AND ISOMETRIC PROJECTION 9

Free hand sketching: Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement - layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects. Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

Total: 45 h

TEXT BOOKS:

1. N.D. Bhatt, “Engineering Drawing” Charotar Publishing House, 51th Edition, (2012).

REFERENCE BOOKS:

1. K. V. Natrajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai (2007).

2. M.S. Kumar, “Engineering Graphics”, D.D. Publications, (2007).

3. K. Venugopal & V. Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited (2009).

4. M.B. Shah and B.C. Rana, “Engineering Drawing”, Pearson Education (2009).

5. K. R. Gopalakrishnana, “Engineering Drawing” (Vol.I&II), Subhas Publications (2010).

6. Dhananjay A.Jolhe, “Engineering Drawing with an introduction to AutoCAD” Tata McGraw Hill Publishing Company Limited (2010).

7. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, (2014).

Upon completion of the course, students will be able to:

Course outcome	**Description**	**Knowledge Level**
CO1	Develop special curves and sketch by free hand orthographic views	K6
CO2	Understand and draw the projections of points, and two dimensions	K2
CO3	Develop the projections of various shapes	K3
CO4	Develop lateral surfaces of the uncut and cut solids	K6
CO5	Develop the perspective projection of simple solids, truncated prisms, pyramids, cone and cylinders and sketch the isometric projection	K3

PHYSICS LAB 0 0 4 2

Lab Experiments

1. Determination of band gap of a semiconductor material.
2. Determination of wavelength and particle size using laser.
3. I-V characteristics of PN junction diode.
4. Measurement of resistivity and determination of band gap using Four Probe method
5. Characteristics of thermistor.
6. Characteristics of photo diode
7. Characteristics of solar cell
8. Zener diode characteristics

Total: 30 h

Upon completion of the course, students will be able to:

Course Outcome	Description	Knowledge Level
CO1	Examine the dispersive power of the prism using spectrometer.	K3
CO2	Analyze the wavelength of spectral lines using spectrometer.	K4
CO3	Estimate the band gap energy of given semiconductor material.	K4
CO4	Calculate the wavelength and particle size of semiconductor diode laser.	K4
CO5	Measure the velocity of ultrasonic waves and compressibility of the liquid using ultrasonic interferometer.	K5

ELECTRICAL ENGINEERING LAB 0 0 2 1

List of Experiments:

1. Basic safety precautions. Introduction and use of measuring instruments – volt meter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification.
3. Resonance in R-L-C circuits.
4. Loading of a transformer: measurement of primary and secondary voltages and currents, and power
5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).
6. Load Characteristics of a DC Motor
7. Torque-Slip Characteristic of an Induction motor
8. Three phase induction motors - Direction reversal by change of phase-sequence of connections.
9. Demonstration of dc-dc converter.
10. Demonstration of dc-ac converter.
11. Demonstration of ac-dc converter.

Total: 15 h

Upon completion of the course, students will be able to:

Course outcome	**Description**	**Knowledge Level**
CO1	Understand different meters and instruments for measurement of electrical quantities	K2
CO2	Implement power and power factor in ac circuits	K3
CO3	Understand 3 phase balanced and unbalanced, star and delta connected supply with load and to measure power in 3 phase circuits	K2
CO4	Understand the Characteristics of DC motor and Induction motor	K2
CO5	Demonstrate various converter circuits and to implement for the particular application	K3

ENGLISH LAB 0 0 2 1

ORAL COMMUNICATION

(This unit involves interactive practice sessions in Language Lab)

Listening comprehensions, Pronunciation, Phonology, Intonation, Stress and Rhythm, Situational Dialogues, Communication in workplace, Interviews, Seminar, Formal Presentations, Group Discussions, Debates, JAM sessions

Total: 15 h

Upon completion of the course, students will be able to:

Course Outcome	Description	Knowledge Level
CO1	Make use of suitable communicative strategies to express their point of views convincingly in any type of discussions and negotiation.	K2
CO2	Construct different types of writings such as narrative, descriptive, creative, critical and analytical reports using appropriate vocabulary besides paying keen attention for presenting error free document.	K3
CO3	Prepare letters to officials and to the Editor in formal and officials contexts	K3
CO4	Infer implied meanings of different genres of texts and critically analyze and evaluate them for ideas as well as for method of presentation.	K3
CO5	Infer meanings of different flow charts and bar charts and develop constructive paragraphs deriving possible information to be obtained from them.	K3